THE DOMINION ARSENAL AT QUEBEC

1880 — 1945

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QUEBEC, 1947.

FOREWORD

The Federal Arsenal which the Government of Canada has established at Quebec is not only one of the oldest in America, but also one of the most important. The services which it has rendered in the course of two World Wars, in 1914 and 1939 respectively, have attracted to it the attention of countries near and far.

Its history is indeed so captivating and so instructive that it is fitting to devote a whole volume to it for the benefit of outsiders who desire to gain information, as well as for that of Canadians who wish to know still more about an institution of which they have reason to be proud.

Those who have devoted their talents and energies through the course of so many years to the accomplishment of a work of this character and who have thus performed a task of capital importance have richly earned the homage that is now being paid to them, perhaps a trifle belatedly. If it is in order to give a large share of credit to the heads who have successively directed the enterprise and who have enlarged its bounds, it would be supremely unjust to overlook the valiant work-

ers whose loyal and generous collaboration has enabled those same heads to reach an objective surpassing the dreams of the most fertile imagination.

Confronted by such remarkable results, it should be clearly understood that it has been the purpose of the present Superintendent in these pages to bring to light, at the same time as the initiatives of his predecessors, the exceptional merits of all those men and women who have assisted him with so much intelligence and with such tireless devotion to win the primary contest of warfare: the production of munitions.

AS A TRIBUTE OF GRATITUDE
THIS WORK IS RESPECTFULLY
DEDICATED TO

THE RIGHT HONOURABLE C. D. HOWE,
B.Sc., LL.D., D. Eng.,

MINISTER OF MUNITIONS AND SUPPLY
IN THE WAR GOVERNMENT OF CANADA,

FOR HIS EFFECTIVE CONTRIBUTION
TO THE NATIONAL MUNITIONS INDUSTRY
SO WHOLLY INDISPENSABLE TO THE
ARTISANS OF THAT ALLIED VICTORY IN WHICH BOTH
THE GLORIOUS SOLDIERS OF THE CANADIAN ARMY
AND THE MODEST EMPLOYEES OF
THE ARSENALS OF CANADA
PARTICIPATED.

PHOTO KARSH OTTAWA.

INTRODUCTION

The furious fire of Canadian troops in Sicily, Italy and onward from the Normandy beaches; the deadly bursts from the guns of R.C.A.F. aircraft, and the blasting weapons of our Navy were but echoes of earlier shots fired here in Canada in a musty subterranean tunnel deep in the grim 17th century fortifications of Quebec. For in the forbidding gray buildings clinging precariously to the rock cliffs of this Gibraltar of the New World lies the very heart of munitions manufacture in Canada.

Canadian-made ammunition carries the acknowledged hallmark of excellence, the broad arrow of His Majesty's Government enclosing a proud "C" for Canada. Fighting men say they could wish for none better. The Nazis and their satellites are not the only ones who have felt its bite, for jungle Japs have fallen too from Canadian bullets fired by United States soldiers from American weapons. Throughout two World Wars, Canada has been without a peer in the making of good ammunition for good weapons.

The secret ingredient lies in the Dominion Arsenal in the City of Quebec. In those old stone

buildings, in the very walls of the ancient city, a group of painstaking craftsmen have for more than half a century toiled ceaselessly, in peace and in war, to ensure that when a national emergency arises our Canadian soldiers and their allies shall have none but the best weapons and ammunition to fight with.

In World War II, as in the struggle from 1914 to 1918, these modern counterparts of ancient armourers and sword-makers, were ready to teach their craft to others, so that manufacturers and skilled artisans from one end of the Dominion to the other could lend their plants, their machines and their knowledge in order to fill, and keep full, the ammunition boxes of our fighting men.

When Le Sieur de Frontenac built the original fortifications along the brow of the cliffs overlooking the St. Lawrence River about 1693 and then flanked the growing little city with earthworks and strong posts, his troops started the tradition of Canadian munitions manufacture, portioning out their gunpowder and fashioning balls for their crude muskets. Later on, gaitered British redcoats crouched in this dim cavern of stone and performed the same military tasks, but it was not until nearly a score of years after Confederation had made Canada one of the world's new nations that the production of ammunition in this country really came into being.

QUEBEC IN 1700

In that nucleus of an arsenal, before the turn of the present century and indeed for many years thereafter, an underground tunnel leading to a cleverly-concealed sally port provided Quebec's arsenal experts with a ready-made shooting gallery in the heart of the city. From daybreak to dusk, rifles thudded faintly deep in the earth testing newly manufactured ammunition. Water seeped down the crumbling walls and stalactites hung from the ceiling like icicles. From time to time the shuffling feet of the ballistics experts testing new cartridges would disturb the earthen floor enough to turn up old English coins, or the corroded button from the long-vanished tunic of a departed English soldier of the Ordnance Corps. Sometimes the earth yielded bits of human bone, perhaps indicating that the soft floor of the tunnel may at one time have been used as a burial ground for soldiers who died during the long winter when the frozen ground of the regular cemeteries was too hard to open a grave.

So from such a beginning has sprung the tremendous record of munitions-making in Canada. Shots fired from test stands in that old tunnel sent their widening echoes through two World Wars. Munitions-making machinery devised and developed under the curved arches of those eight-foot fortification walls, blazed the trail for the development of towering batteries of gleaming

machinery in spick and span modern factories across the Dominion. The knowledge and experience of the graying experts of Quebec produced the weapons and projectiles which stopped the Tiger tanks and slew the enemy until the survivors surrendered.

Twice now Canadian industry has earned the ungrudging respect and admiration of the United Kingdom and other Allied nations for an uncanny knack of turning out gigantic quantities of shells and small arms ammunition of top-grade quality. The story of each Canadian manufacturing plant, which in time of war has turned its machines and personnel over to munitions production, if told would constitute a glorious tale of courage, ingenuity and sheer hard work, but one that would require a volume far greater than the present one. We must content ourselves then with relating the story alone of the Dominion Arsenal, as core of the industry, and of the men of the Arsenal and those associated with its development and operation. In other words, this is to be the saga of the "professionals" in Canada's munition trade.

A STRONGHOLD

Nature has made a stronghold of Quebec. Elevated upon a precipitous rock that thrusts out into the river like the prow of some gigantic ship, the city commands the most important sea route

of the North American continent. The strategic value of such a position could not escape the attention of those who had come here to found a colony. Champlain made haste to put up palisades to shelter his men against surprise attacks by the Indians and on the height which dominates Sault-au-Matelot Street, he built a somewhat primitive fort that Montmagny strengthened with substantial masonry. From 1690 to 1694, Frontenac caused redoubts to be built and three gates; those of St. John, St. Louis and the Palace, respectively. These fortifications, supported by earthen ramparts and stone bastions, extended from the St. Charles River up to the cliff at the summit of Palace Hill. They formed an enclosure of a mile and a half, protected by 56 cannon and 82 mortars. Improvements were made from year to year until 1703, when at the request of Governor de Callières, the Engineer LeVasseur prepared a second plan in 1704.

These works, however, do not seem to have been satisfactory to Chaussegros de Léry who succeeded LeVasseur and who in 1720 secured approval for a much more elaborate project. Yet even this plan still left room for improvement and numerous changes were subsequently made in it. The system of defense had not been well arranged and certain works had been poorly executed. Negligence having been added to these errors and imperfections, Montcalm was prompted to write

in 1758: "The fortifications are so bad that they would be taken as soon as they were laid siege to". Of the three gates built under Frontenac, that of St. John was demolished by Chaussegros de Léry in 1720, then rather indifferently rebuilt in 1791, while the Palace gate had to be reconstructed in 1823, after having been restored in 1790. The St. Louis Gate was repaired in 1721 and 1783, then modified in 1823.

The report of General Murray on the morrow of the capitulation pointed to the lamentable state of the walls. Indeed he considered them incapable of repair and the three gates to be of little use.

During some fifteen years, the English authorities did not trouble themselves to make the fortifications more modern. But after Arnold had penetrated too close to the heart of the city in 1775, there was agitation in high places. The idea of a Citadel dates from 1779, when Governor Haldimand enumerated in a letter to Lord Townshend the reasons that demanded the transformation of Quebec into a *formidable* fortress, according to his own expression. At this moment there existed on Cape Diamond nothing but the du Bourreau redoubt and a powder magazine.

The plan conceived by Captain Twiss in 1783 included a temporary citadel covering an extent approximately equal to that enclosed by the pre-

A MARTELLO TOWER

sent walls. In 1800, a depot service was established within the walls and the following year a stone powder factory that may be considered as marking the origin of the Arsenal. From 1804 to 1822, four Martello towers — one of which was destined to disappear in 1900 — were added to the Citadel fortifications that the British authorities had resolved to make permanent.

This project, carried out according to the plans of Holland and Twiss by Colonel Durnford, endowed Quebec with a magnificent Citadel of which this old city today is proud. Four gates were added to the three built by Frontenac; in 1786, The Hope Gate that was considerably improved in 1823; in 1793, the Prescott Gate, reinforced at the same time as the Hope Gate; in 1823, the Chain Gate and, in 1827, the Dalhousie Gate, both of them situated at the entrance to the Citadel.

The Palace Gate was razed in 1864, the Prescott Gate in 1871, the Hope Gate in 1874 and the St. John Gate in 1893. The last named was rebuilt later on but in very different proportions, just as the St. Louis Gate had been replaced in 1873 by a different structure which served as model in 1879 for the gate erected to the memory of the Duke of Kent.

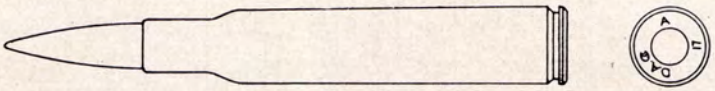
Rearing itself proudly at the point of the promontory, over a containing wall two miles long,

the Citadel today is the only work that preserves for Quebec its appearance as a fortified city and which — with remains that are all too few — causes the past to live again in its captivating charm, although the construction actually goes back only to the beginning of the 19th century. But its cachet is such that it makes one think immediately of the strongholds that have made forever famous the name of the Marquis de Vauban. Built between 1823 and 1832 at a cost of $35,000,000, this Citadel has remained virtually intact. With the exception of a few additions of secondary importance, only repairs absolutely necessary to protect it against the ravages of time have been undertaken. On a terrain of forty acres it at present shelters 25 buildings, among them the bastions of the King and of the Prince of Wales, the residence of the Governor-General, the quarters of the officers and men and the casemates.

An old time powder factory possesses very special interest by recalling, as we have already observed, the origin of the Arsenal.

FIRST SECTION

QUEBEC SHAPES THE ARM



CHAPTER I

COLONEL OSCAR PREVOST

1881 — 1895

The plans for a Canadian Arsenal were realized only about 1879. Until that date, rifles and cartridges had been imported from England but the serious inconvenience of such a system became apparent when a large number of volunteers had to be equipped in haste to meet the Fenians. Article 15 of the Constitution of 1867 provided for the maintenance of a Militia and an annual expense of $900,000 had been estimated for a force of 40,000 men. The possibility of producing arms and munitions in the country was therefore brought to the attention of the authorities but so many problems arose all at once that twelve years elapsed before a decision could be reached in this connection. It was felt all the more strongly desirable to mark time when, during the second Fenian invasion, the Imperial Government made a gift to Canada of the 44,000 carbines and rifles that had previously been lent to her and

it was natural that the munitions suitable for these arms should be procured in England. But with the recalling of the British troops, who left Upper Canada, Lower Canada and New Brunswick in the course of 1870, Canada found herself obliged to assume very heavy responsibilities. In the autumn of that same year it had been necessary to replace by a garrison of volunteers under the command of Colonel Wily of the 60th Regiment (Rifle Brigade), the one that had been withdrawn from the Citadel at Quebec.

The Canadian Militia was made up of infantry, cavalry and artillery. Schools were established at Toronto and Winnipeg for the cavalry; at St. John, Fredericton and Toronto for the infantry; and at Kingston for the artillery. This last named town was subsequently endowed with a Military College. Quebec was given only a school for garrison artillery, but its share was considerably increased later on when the Government assigned to it a cartridge factory for the manufacture of munitions for carbines and artillery.

Naturally there was no complete agreement upon the place best suited for the establishment of such an enterprise. Called upon to give his opinion, Lt.-Colonel Smyth designated the City of Quebec in a remarkable memorandum in which he anticipated nothing less than the erection of a real Arsenal. "Under the protection of the guns

THE ARTILLERY BARRACKS

THE PRESENT ST. JOHN GATE

of the Citadel", he said in substance, "this Arsenal would be sheltered from any assault. Should the enemy pierce the first lines of defense, the positions lend themselves admirably to a counter-attack." And he added: "From this city, war material could be transported with ease by water and by railroad, while raw materials could reach it quickly." "No other fortress in North America," he continued, "offers such advantageous conditions."

For his part, Captain Edward Palliser, British expert on war material, recognized that the fortress of Quebec was eminently well suited to the establishment of an Arsenal.

On December 22nd, 1879, the Council of Ministers, deciding that these considerations were sound, ordered the institution of a munitions plant and fixed their choice on Quebec. Two days later, the Federal Cabinet, through the Minister of Defense, requested the Governor-General to solicit from the British Government permission to admit an officer of the Canadian Army to the Royal Arsenal in order that he might receive training there in the direction of the new Canadian factory. At the same time the sum of $31,300 was appropriated to serve for the purchase of the equipment to place this factory in operation.

The British authorities readily granted the request of the Canadian Government and Captain Oscar Prévost, Commanding Officer of Battery "B" at the Quebec Artillery School, was chosen to pursue his studies at Woolwich.

A better choice could hardly have been made. Admitted to the Bar in 1866, Oscar Présvost had quickly become so prominent in it that he was invited by Sir Adolphe Chapleau, later Prime Minister and Lieutenant-Governor of the Province of Quebec, to become his partner. But however promising for him may have been the future in this sphere, the young advocate felt himself irresistibly drawn to a military career and he soon abandoned the lawyer's robe for the uniform of a soldier. Made Lieutenant in the 45th Battalion, he received his baptism of fire in an engagement with the Fenians, while a change in the Quebec Rifles Regiment permitted him to serve in the North West Expedition under Lord Wolseley, later Commander-in-Chief of the Imperial Army. He had been attached to Battery "B" of the Royal Canadian Artillery since 1876, with the rank of Captain, when the authorities fixed their eyes on him to entrust him with the direction of the new Arsenal and he justified this confidence by obtaining at Woolwich marks of high distinction in examinations on armaments and ballistics.

From the moment of his arrival overseas, Captain Prévost saw to it that England supplied

Canada with the most highly perfected equipment. In March 1881, a contract assured the shipment of all the machinery required in the following four or five months. Since the Enfield-Snider rifle had given place to a more modern arm and it was desired that arms and munitions should be made uniform throughout the Empire, it had likewise been provided in advance that Martini-Henry cartridges should be manufactured at Quebec, instead of the Snider.

On the 21st of April, Captain Prévost returned to Quebec and busied himself in getting together skilled Canadian labourers to build the factory quickly. The Federal Government voted $13,521 to pay for the first construction and for repairs to the old buildings that it was proposed to make use of. The former artillery barracks stituated near Palace Hill were destined to form the nucleus of the Arsenal and they were unfortunately in very bad condition.

Not enough thought is given today to the enormous difficulties that had to be overcome at the beginning, nor to the merits of those who finally triumphed over them. It was not easy to hollow out walls and pierce through fortifications — whose remains still amaze Americans and Europeans — in order to put heavy machines in place.

The years 1881 and 1882 were the hardest. Members of Parliament, who were little informed

on the obstacles to be overcome, denounced as so many evidences of neglect the delays that occurred in several domains. Notwithstanding the energetic protest of the Minister of Defense, Sir Adolphe Caron, and his convincing exposition of the results accomplished, the critics seemed to be justified by the fact that the cartridge factory had still produced nothing by the autumn of 1882. The fault assuredly was not with those who had so boldly set about the work but complications of every kind developed. Thus it was in connection with the supply of explosives, since the owners of merchant ships were reluctant to transport them from England to Canada and, even after the crossing had been completed, refused to discharge the explosives in the port of Quebec for fear lest an accident in handling might blow up the cargo. In the end, gangs of Major Prévost's workers had to meet these ships to load the boxes of explosives into small boats in midstream.

This intolerable situation led the authorities to decide to obtain supplies of explosives in Canada, instead of importing them from England. Already, for target shooting, a black powder manufactured in the country was beginning to compete with English powder and the Canadian product had met the comparison favourably. Accordingly, it was decided to procure all black powder henceforward at Montreal, the imports being a source of continual trouble in any case.

THE COVE FIELD FILLING SHOPS

THE FIRST ARSENAL BUILDINGS

It was only in October 1882 that the seventy machines of the factory were placed in operation and to accomplish that prodigies of ingenuity were needed on the part of a staff that had been improvised on the spot. A month later the machines were already in full production. In April 1883 Sir Adolphe Caron was able to inform Parliament that the Arsenal was functioning with indisputable success and that the cartridges manufactured at Quebec were not only less expensive, but of a better quality than those which had been imported previously from England.

At that time, the cartridge factory had only a dozen permanent employees but the Canadians showed themselves to be very skilful, with a surprising aptitude for practical mechanics. The administrative staff consisted only of two members and the foremen had only five permanent machinists under his orders. The employees did piece work. In 1883 the plant had thirty-seven employees in all. Nevertheless, in twelve months' time, a million cartridges were produced while nearly a million cartridge cases were in process of manufacture and a quarter of a million imported ones that had deteriorated, were replaced.

There is still in existence official testimony that constitutes a remarkable tribute to the prodigies achieved under excessively difficult conditions. In the course of 1884, a Commission of high ar-

tillery officers from Ontario and Quebec were instructed to inspect the new Arsenal, together with a representative of the Headquarters Staff at the Federal Capital.

The report of this inspection is the finest eulogy that could be given. It declared that the Canadian cartridges gave better results than the English model in the years from 1877 to 1882, and their use was recommended throughout Canada. In the face of this eloquent testimony, it is to be noted that the factory had cost the State to that date less than $50,000 and the largest part of this sum had been devoted to the purchase of machinery. The cartridge factory, moreover, attained this high degree of excellence with a gross output of 2,200,000 cartridges produced by a staff of less than forty employees.

Such brilliant results explain the lustre with which the official opening of the Arsenal — that took place in the course of this same year 1883 — was surrounded and the praises that were given spontaneously with one accord by all the newspapers of the country.

Two years later the output of the plant was double what had been estimated and this unhoped for result decided the Federal Government to add the manufacture of shells to that of the cartridges. Plans that had been under study for

the production of 9 and 64 pounder shells were already well advanced and before the end of the year 1887 the actual production of these shells was under way, notwithstanding the time taken in repairing several buildings of the cartridge factory that threatened to fall into ruins. Another problem that was disagreeable enough presented itself at the same time. The powder bought in Canada was no longer of the same high quality as at first and it was necessary to resume the importation of English explosives.

The best spirit prevailed among the workers. Even when the foundry moulders thought that they were entitled to claim an increase of salary, they made a point of finding ground of agreement, rather than have recourse to drastic steps. It should be recognized on the other hand that they were the objects of a constant benevolence.

Up till 1888 only six more or less serious accidents had occurred at the Arsenal; compared with the accidents that occurred in English and American Arsenals, this figure is particularly impressive.

In conformity with an understanding reached during his stay in England, Major Prévost had sought unceasingly for some practical way to convert Snider into Martini-Henry cartridges and he had carried out repeated experiements to that

end. In 1889 he proposed to Ottawa to make this change, specifying that — thanks to machines invented in the Quebec factory — this conversion could be made in half an hour and the other way about, if it should be decided later to go back to the Snider cartridges. It was two years later, however, before production of Martini-Henry cartridges was begun on a large scale.

In 1890, the manufacture was undertaken of shells from cast iron obtained from the Three Rivers foundry. This iron proved to be of as good quality as the English product and the definite use of domestic iron for the manufacture of 9 and 64 pounder shells was advocated.

From the opening of the Arsenal, a subterranean tunnel in the very heart of the city had been utilized for firing tests. From dawn to sunset, one could hear the dull rattle of cartridges being tested below ground and, as we have seen, it would happen that ballistic experts digging up the ground found in it English coins or tunic buttons recalling turns in fortune of an eventful past.

The range was later moved to the Cove Fields where the quality of the cartridges, as they left the factory, was assured. In 1891, when it became necessary to test heavy shells, the range was moved from the Cove Fields to the Island of Orleans and it was during this same year that the

ENTRANCE TO THE PALACE HILL SHOPS

first experiments with cordite, a new smokeless powder, were made; these being crowned with gratifying success.

A very important innovation was made in 1892 when the Martini-Henry rifle was changed to the Martini-Metford by the substitution of a barrel of smaller calibre.

In spite of the perfecting of the equipment and the skill acquired by the workers, the cost of manufacturing ammunition remained relatively high. Only mass production could remedy this drawback and the Superintendent succeeded in finding a solution that he hastened to submit to Ottawa. His project necessarily anticipated the erection of a new building and an increase of equipment but the arrangements were so made that mass production could be carried on to the best possible advantage. Pledged to a policy of economy, however, the Minister of Defense did not feel able to implement the recommendation made to him.

The results of a competition of the Dominion Rifle Association in 1892 were all to the honour of the Arsenal. The highest points and the first prizes were won by riflemen using Canadian cartridges.

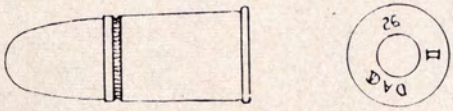
One does not expend his energies, as the Superintendent of the Arsenal had done and never

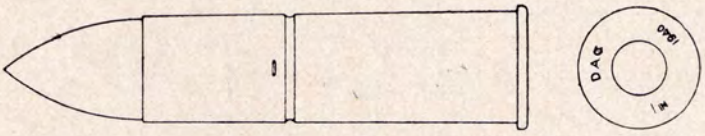
ceased doing from 1881, without paying for it. In 1895 Major Prévost, who had been the soul of the cartridge factory, died to the great regret of the authorities and of all those who had been witnesses to his work. He had been essentially a creator. His brilliant services proved to be a source of inspiration to his successors who were called upon by circumstances to continue a work whose initial period honours the spirit of initiative of Canadians to a high degree.

THE PERSONNEL

Assistant-Superintendent: Captain Antoine de Lotbinière Panet

DICKSON, W. DUPRÉ, ALF.
DUCHESNAY, A. J. HALLÉ, F.
GUILLAUME, M.





CHAPTER II

COLONEL F. M. GAUDET

1895—1913

Lt.-Colonel Prévost was succeeded in 1895 by Captain Frecerick Mondelet Gaudet, who obtained his majority three years later and who was in 1914 the First Commanding Officer of the Royal 22nd Regiment, a French-Canadian unit. In 1887, when only 20 years old, he had received his diploma from the Royal Military College at Kingston, together with the Governor General's medal. In the course of the winter of 1895-96 he visited England in order to inform himself as to the relative advantages of cordite and other smokeless powders. Thanks to the British War Office he was able to study the reports of large scale tests made by the Government of England and India, effecting in this way an economy of time and expense. Moreover, the Director of the Laboratory in the Royal Arsenal at Woolwich made it easy for him to carry out other researches;

as for instance by permitting him to make use of the Arsenal's test ranges and instruments. As the result of his studies, Captain Gaudet proposed the use of cordite in small arms cartridges, the cordite from England having given satisfactory results when tried out in Canadian atmospheric conditions.

Like his predecessor, Major Gaudet had at heart the organization of the Arsenal on a footing of high efficiency, so as to make it one of the leading institutions of its kind. He set himself to obtain from Ottawa the assistance he required and continued the policy of encouraging Canadian industries. He watched over the welfare and technical training of his staff. He never ceased introducing in the work shops, the test ranges, and all the departments of the Quebec Arsenal, the improvements that were to carry this institution later on to a development that classed it first among the Arsenals of the British Empire, if not of the whole world. Every department benefited from his talents and his tireless energy; from the production services to the Archives and the Accounting Department. In all this, he was ably helped by A. de Lotbinière Panet, his assistant.

He, in turn, experienced numerous difficulties and in every case he was able to overcome them by an indomitable determination. In this connection may be mentioned the campaigns aimed

against the Quebec Arsenal and its products, particularly in 1899. During the meet of the Dominion Rifle Association, numerous complaints were published in the press about the quality of the cartridges from Quebec. After the meet, Major Gaudet sought by means of tests to find out the cause of the hangfires complained of. Cartridges were selected at random in the ammunition stores, among those supplied to the constestants, together with a number of English cartridges, dated 1897, and the results of these tests proved that the criticism had been made in ignorance or without reflection. In certain cases, Major Gaudet suspected prejudices but in order to identify the source of the grievance and to prevent new complaints, all the wrappings and labels from then on were printed and dated.

In 1913, Colonel Gaudet and the Arsenal emerged victorious from another trial. Certain newspapers had insinuated that the administration, following changes made in its shops, had suffered the rejection of millions of .303" cartridges. An investigation being held, this charge was refuted and Colonel Gaudet was completely exonerated.

On June 12th, 1899, a violent explosion occurred in the drying-room for fulminate of mercury, which was completely destroyed. Fortunately, the workshop sustained very little damage and

there was but one loss of life, thanks to the safety measures that had been taken.

In 1898, the final assembly operations were delayed by the unduly slow delivery of copper strips for the percussion caps that had been ordered in England. In spite of this, production was continued so that the disposition of unfinished products became a serious problem that threatened to paralyze the establishment. Colonel Gaudet in 1897 had proposed the erection of a plant for the rolling of brass and cupro-nickel strips for cartridges. Parliament voted the necessary credit in 1899 and the work began. Funds were voted at the same time for the manufacture of steel shells to replace those of cast iron.

In view of the great number of additions that had been made to the plant in the course of the years, it could no longer be called a factory and in 1901 its name was changed to that of Dominion Arsenal. Apart from the central workshop, which was the nucleus of the Arsenal, the establishment now included a shell factory, a building used as a laboratory, a rolling mill and a brass foundry. At the same time, a building was under construction for the foundry, as was also the artillery workshop, while both the shell factory and the laboratory were being enlarged.

At the beginning of the century the principal difficulties in the manufacture of small arms cart-

THE PALACE HILL ARSENAL,
SEEN FROM ST. VALLIER STREET

THE PERSONNEL IN 1913

ridges had been overcome and during two successive years, not a single complaint was heard. Moreover, the high points obtained in the meets of the Dominion Rifle Association in 1900 and 1901 showed the high quality of the cartridges. The year 1902 was marked by a strong demand for greater output. The hours of work were increased from forty-eight to sixty hours per week and the method of paying the employees on the basis of piece work was extended as far as possible to all the services. Additional machines were on the way from England in order to make it possible to meet the increasing production called for.

It was proposed to build another cartridge factory in the West but Major Gaudet maintained successfully that a single plant would be more profitable and efficacious, while the storing of the munitions at strategic points would solve the problem.

New improvements were made in 1902. Experiments looking to the production of a full-sized cartridge for miniature rifle ranges were abandoned when Major Gaudet invented a conical bullet that met all requirements.

The method of accountancy and the manner of keeping the store records was greatly improved but the need for a draughting room made itself keenly felt at this time, in view of the extent to

which models and drawings of machines and parts had accumulated. This matter was dealt with at a later date.

Major Gaudet visited England during the winter of 1901-02 in order to keep in touch with the most recent progress in the various techniques used in the manufacture of arms and also to procure several machines that were to be installed in 1903. The output fell off that year due to delays in the construction of new shops.

Major J. D. Brousseau of the Army Medical Corps, was the first permanent military doctor of the Arsenal, being appointed to that position in 1903. It was likewise in that year that Dr. A. E. MacIntyre was permanently appointed as Chemist, the chemical laboratory having become one of the most important divisions of the Arsenal. These were two notable appointments. Moreover, it should be said that the administrators have always been careful to the highest degree for the welfare and health of their staff.

Salaries were increased by ten percent in order to meet the rising cost of living, while a better accounting system increased efficiency and effected at the same time.

The workers now possessed an excellent training; their tasks were more specialized than in the early

days of the Arsenal and the tendency towards specialization was more marked in all domains.

In 1912, a new accounting system made it possible to stabilize the budget of the Arsenal at $300,000 and in spite of the increased salaries there were surplus credits.

The Cove Fields having been included in the Battlefields Park, the Arsenal acquired a large ground in St. Sauveur Parish which could be organized as its test ground.

The term of Colonel Gaudet as Director of the Arsenal expired in 1913. On the declaration of hostilities in 1914, he became the first Commanding Officer of the French Canadian Twenty-Second Regiment, holding this position from September 1915 until January 1916. He was frequently cited in dispatches.

He was later named Officer of the Legion of Honour and in 1918 the British Government recognized his services by making him a Commander of the Order of St. Michael and St. George (C.M.G.) and at this time he was appointed General Manager of the National Filling Factory, of Hereford, England. He was also consulting expert of the Imperial Munitions Factory.

Colonel Gaudet in 1940 directed a group of Canadian engineers who were studying modern

munitions in England. The conclusions of these studies were of considerable use to the vast munitions industry which developed in Canada during the five following years.

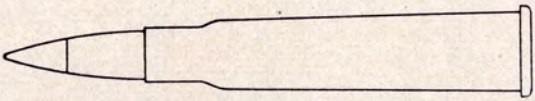
At the age of seventy-four years, Colonel Gaudet in 1941 was consultant engineer of the Cherrier explosives plant at St. Paul l'Ermite.

He had devoted nearly a half-century to the service of his native land.

THE PERSONNEL

Assistant-Superintendent: Major Antoine de Lotbinière Panet.

Barbeau, Georges
Barrington, J.
Bryson, J.
Côté, P. O.
Davies, W. G.
Dénéchaud, Chs.
Devigne, J. P.
Dollard, P.
Dupré, A.
Hallé, F.
Hannon, O. J.
Julien, J.
Kipling, Jos.
LaRochelle, Jos.
Lewis, Miss M.
MacIntyre, A. E.
Mignault, C. [Ph.D]
Newton, S. G.
Nichols, L.
Poirier, J. E.
Rouillard, J.
Sibthorpe, W. G.
Turcot, Dr. G. G.
Young, E.
Walters, H.



CHAPTER III

BRIGADIER-GENERAL FRANCIS D. LAFFERTY

1913—1919

Major F. D. Lafferty succeeded Colonel Gaudet in 1913. A year later the war broke out in Europe and Canada decided to participate in it actively.

In January, 1914, the new Director had to apply to the Government for the sum of $60,000 to continue operations until the next fiscal year. A considerable part of the budget had been applied to payments for material. To the Minister of Defense, Sir Sam Hughes, who was supporting this request for funds in the House of Commons, a member from New Brunswick rejoined that it would be better to convert the Quebec Arsenal into a chemical fertilizer factory. This sarcastic remark received a scathing answer several months later when the Kaiser's legions started the invasion of Belgium and France and when Canada was drawn into the conflict, with the rest of the Empire.

During the four years that followed the real value of the Arsenal was fully appreciated.

The war of 1914-1918 was only twenty days old when the Minister of Militia at Ottawa received from London a cable to the effect: "Can you furnish shrapnel shells or obtain them from the United States?" Later this request was made more specific; the Ministry required two hundred thousand shells and the Federal Cabinet decided to meet this request here in Canada. The Arsenal, with the resources then at its disposition, would have taken eleven years to manufacture so large a quantity of shells. It was necessary, therefore, to have the cooperation of Canadian industries and a beginning was made by the formation of a Shell Committee under the Chairmanship of Sir Sam Hughes, Minister of Militia.

The leading industrialists of the country were invited to serve on this Committee for the organization and development of production. The necessary steps were taken to obtain material for the manufacture of shells and at a meeting of the Committee held at the Chateau Frontenac, Quebec, Colonel Lafferty received his first specific instructions to place the strength of Canadian Industry on a war footing. Two thousand shell forgings that the Arsenal had in stock were to be sent to the four selected manufacturing firms, each one of them to receive five hundred forgings. These

firms were John Bertram & Sons, of Dundas; Goldie and McCullock, of Galt; the Canada Foundry, of Toronto; and the Canadian Rand Drill, of Sherbrooke, P.Q. These were the experimental installations for the main war production in the years to come.

Everything depended now on the speed of production and the essential point was to obtain a sufficient supply of steel. In addition, an inspection of the factories was necessary to ensure their fitness to produce shells in each case.

Labour and machinery were required. An appeal was made to all the manufacturers of the country. In the month of March 1915, the representatives of two hundred and fifty-nine companies had been sent to the Arsenal, where they received information and instructions on the subject of British munitions. In the course of the first nine months of the war, three hundred and fifty-six American and Canadian firms sent representatives to visit the Arsenal. Parliament voted a credit of $660,000 for war purposes, over and above the regular Arsenal grant.

One of the first problems studied by the Shell Committee was that of the steel, which had to conform to rigorous specifications as to its physical properties after heat treatment.

The Dominion Arsenal was the only institution in America which had, at this time, any experience in the manufacture of English munitions or that was producing them. In view of the extraordinary demand for munitions at the moment, the Arsenal appealed to all the factory workers, making every effort to convince them first of all and then to teach them how to proceed, giving them an approximate idea of the cost of each operation and of each constituent part.

When the factories that were still insufficiently experienced in this work encountered difficulties, the Arsenal sent them an expert to help them. If there was a shortage of parts anywhere, the Arsenal shipped them to the manufacturers and in this way prevented any halt in production.

During the first three years, the Inspectors of the Imperial Government tested all the munitions from Quebec. The test ranges were situated on the Arsenal grounds and the Arsenal prepared all the munitions for the British Inspectors, including the shells, percussion caps, propellants, cases and fuses. It was the Arsenal staff which did the research work and the experiments, as also the repairs of the guns and the gun mountings used by the Inspectors.

The manufacture of eighteen and fifteen pounder shrapnel shells necessitated the assistance of many

industries. The workers were divided into two classes; the manufacturers and the assemblers. steel mills already had their experts in the manufacture of steel rods for the shell bodies and the washers, but the forging of the shells was an innovation. The washers presented no particularly difficult problem, nor did any of the other constituent parts. Copper bands had to be obtained from the United States, since Canada was not properly equipped to manufacture them.

The regular machine shops were easily adapted to the finishing of the shells, but expert machinists were not sufficiently numerous.

The Dominion Arsenal taught the manufacturers the new skill required and helped them to equip themselves; this role being the precursor of the one of still greater importance that the Arsenal was destined to play a generation later, in the struggle against the Axis.

Colonel Lafferty did not long survive the termination of hostilities. He died November 29th, 1919, nine days after his promotion to the rank of Brigadier-General and the employees of the Arsenal erected a monument over his grave as a mark of their affection for him.

He was born in 1877 at Pembroke, Ontario, the son of Doctor J. D. Lafferty, of Calgary. He

graduated from the Royal Military College at Kingston in 1896, with the badge for gunnery (1894) and with the rank of Company Sergeant Major (1895). After leaving college he set out with the Royal North Western Mounted Police to make a map survey through the Yûkon. In 1899, he obtained a commission in the Artillery and served in the South African War. From 1905 to 1908 he was Staff Ajutant of the Royal Military College at Kingston and in 1909 entered the Ordnance College at Woolwich where he spent two years.

In 1912, he settled at Quebec and became Chief Artillery Instructor at the Citadel. After holding this post for eighteen months he was appointed Director of the Dominion Arsenal, October 14, 1914, and on his promotion to the rank of Colonel in January 1917, he was also entrusted with the Arsenal at Lindsay, thus becoming the Director of the Dominion Arsenals.

Some six weeks before his death, Colonel Lafferty had raised the question of Canada's state of preparedness and had proposed the creation of a reserve for the manufacture of shells, to be in the hands of private industry. This reserve should consist of a certain number of selected firms which would maintain in their equipment special machines, suitable for the manufacture of shells, that would be furnished by the Government, together

with all apparatus, calibrating instruments, et cetera, ready on the spot and abreast of the latest progress. Thus, while the Arsenal would be able to meet the ordinary demands of Defense, the private industries would be in a position, soon after having been warned, to throw themselves into the production of shells on a large scale, in case of an emergency.

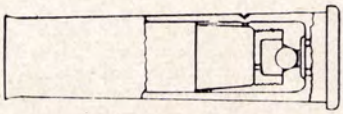
The Government did not adopt this proposal. No one wished to hear war spoken of any more and the thoughts of all were on peace. Twenty years later, when Hitler launched his bid for the conquest of the universe, the Dominion Arsenal was still of modest proportions and found itself faced by a task infinitely heavier than in 1914.

Fortunately, the Management was able to make up for lost time, as we shall see in the following chapter.

THE PERSONNEL

Assistant-Superintendent: Captain S. S. Weatherbie.

Ansell, G. N.
Armstrong, E.
Barrington, J.
Barnes, F.
Bilodeau, J. C.
Bissonnette, W.
Bradley, R. A.
Bryson, J.
Carey, G.
Clark, R.
Cauchon, L.
Côté, P. O.
Côté, P. E.
Cantin, F.
Clavet, R.
Cornell, H. J.
Dénéchaud, Chs.
Dupré, A.
Egan, E.
Hannon, O. J.
Fleming, A. A.
Grenier, J. A.
Hallé, F.
Julien, J.
LaRochelle, Jos.
Lewis, Miss M.
Mignault, C.
Newton, S. G.
Pakenham, A.
Poirier, J. E.
Ruthven, Miss E. M.
Samson, A.
Sheppard, W. T.
Turcot, Dr. G. G.
Young, E.



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CHAPTER IV

COLONEL H. R. V. COUNT de BURY and de BOCARMÉ

1920—1936

The successor of Brigadier-General Lafferty at the head of the Arsenal was Lt.-Colonel Henry Robert Visart Count de Bury and de Bocarmé, C.B.E., son of a Belgian nobleman, Robert Visart Count de Bury and de Bocarmé, a former consular agent of France and Belgium at Saint John, N.B.

Lt.-Colonel de Bury was born at Constance, Germany, in 1872. He was educated at Stonyhurst College in England, and in 1892 entered the Royal Military College at Kingston, Ontario. In that same year he was commissioned a sub-lieutenant in the Royal Garrison Artillery. Promoted captain in 1900, he later received his majority. From 1903 to 1905 he served in Ceylon and Saint Lucia, B.W.I., as Garrison Adjutant. During the five following years he was instructor of artillery tactics, of reconnaissance and of military

law at the Royal Military College at Kingston. Later on, he taught military tactics at McGill University. In 1911 he was appointed captain in the Ordnance Corps of Canada. He saw service in the Great War.

The task of completing the reorganization of the Arsenal in order to meet the special needs of peace-time, a reorganization begun by Brigadier-General Lafferty at the end of his career, fell to the new Director.

Two major causes contributed to making the de Bury administration apparently less active than the two which had preceded it: one of these was pacifism, which turned Canada and her Allies away from all that had to do with war, after the world conflict of 1914; while the other was the financial depression of 1929 which made the Federal Government parsimonious with regard to the Arsenal for several years.

Nevertheless, under the direction of Colonel de Bury the Quebec Arsenal continued to perfect itself, as will be seen hereafter, so as to be prepared for any eventuality at need. Even if the Government grants were cut and the staff reduced, the quality of the work continued to make progress notwithstanding and with restricted funds the equipment continued to be improved in every way.

THE D'AUTEUIL STREET PLANT

The number of employees had diminished from 900 during the last years of the war, to less than 400 in 1920. The big war grants for the Arsenal works were reduced by the Government for the fiscal year ending March 31st, 1921, to $433,000.00, the expenses at Quebec totalling $387,969.00. The expenses of the Quebec Arsenal that year amounted to some $100,000.00.

The Arsenal was closed for a time during the summer of 1920. The following year the number of employees dropped to two hundred and fifty-eight and for several years it was maintained at this minimum level, necessary for carrying on operations.

It was the time when the principal nations favoured the policy of disarmament. All the Allies were diminishing the strength of their armies and their navies. The naval ratio came into effect. England, the United States and France de-commissioned ships. War was banished. The arsenals were destined to disappear, according to the idealists.

The Dominion Arsenal at Quebec was engulfed in this wave of universal pacifism and its development was slowed up. However, the administration and the keenest leaders in the Defense Ministry continued to be vigilant. Although the grants for war purposes had been cut to the limit,

they maintained the strength of the Dominion reserve.

Danger threatened in Europe. Mussolini had conducted a revolution in Italy and was seeking to re-establish the Empire of the Caesars. The German National Socialists had torn up the Treaty of Versailles. They had not yet come into power but their influence was growing. The Dominion Arsenal was watchful and with Colonel de Bury setting the example, the establishment was maintained in perfect order ready for great undertakings, whenever the signal should be given.

This policy bore fruit in the ten years that followed. In 1936 Civil War broke out in Spain which was really the origin of the European holocaust. From that moment, men's minds were more or less haunted by the spectre of another war.

At the beginning of 1933 Adolphe Hitler seized power in Germany and undertook the execution of his Nazi programme of universal conquest. The gigantic conspiracy was not yet in evidence but military authorities suspected what was going on. The General Staff at Ottawa and far-seeing statesmen of the Capital foresaw the danger.

One of the means of averting it was to create a supply of munitions before it became too immi-

nent. The Dominion Arsenal on Palace Hill was insignificant compared to European Arsenals. It was obviously impossible for it to meet the needs of a war similar to that of 1914-18 without outside help. It was necessary, in the opinion of men of foresight, that the Arsenal should become a permanent school in the manufacture of munitions, with model equipment and having at its disposal experts who would be able, in case of danger, to quickly form an army of munitions manufacturers from Halifax to Vancouver.

This was, however, a costly luxury while war was still banished. Military authorities had no faith in the illusion that wars were at an end for all time to come but lacked money to carry out the preparatory programme.

The great financial depression which constituted an obstacle in the development of the Arsenal, by limiting government generosity toward it, was however, on the other hand, the indirect cause of an almost providential development. The economic crisis that followed the crash of 1929 reached its peak in 1932 and 1933. In the United States, President Roosevelt organized the New Deal to put an end to despondency and unemployment. In Canada, an effort was made to solve the problem by the execution of public works and the distribution of direct assistance.

Among the public works undertaken to combat unemployment there were probably none less appreciated at the time and that proved to be more useful in the end than those at Valcartier.

General McNaughton suggested to the Government the use of single men who were unemployed in preparing the ground at Valcartier for the construction of a new Arsenal and this project was accepted, although it stirred up violent opposition.

In April 1933, one of our leading public men asked the Minister of Defense, Honourable D. M. Sutherland, in the House of Commons, what the thousands of assisted workers were doing at Valcartier. He was told that these single men — numbering about one thousand and almost all of them from Montreal — who were unemployed and homeless, would be occupied in opening roads, levelling land and doing other preparatory work with a view to transferring the Arsenal from Quebec. These men received allowances of twenty cents a day, over and above their subsistence.

While these works were still in progress, the shadow of war loomed larger on the other side of the Atlantic. In 1934, the Estimates for National Defense, in the Federal Budget were five million dollars. Mr. Woodsworth of the C.C.F. strongly opposed this heavy expense, especially in a time of

depression. "Against whom are we preparing to defend ourselves?" he inquired. And it was Adolph Hitler who answered his question several years later. Like many others, the Leader of the Commonwealth Co-perative Federation thought at the time that it was merely a matter of an armaments race.

Fortunately, the idealism of Mr. Woodsworth counted for little against the realism of the statesmen at the head of the Government. The Valcartier works continued. During 1934, from fifteen to seventeen hundred men were working on the opening up and the digging out of the site for the new Arsenal.

Five years later, the Valcartier works that had been undertaken to relieve unemployment constituted one of our principal means of national defence and contributed in a large measure to the downfall of the Axis. It was, indeed, the building of the shops at Valcartier, begun before the outbreak of hostitilities, that enabled Canada to take so effective a part in the crushing of the aggressor of Berlin

At the end of 1936 when Colonel de Bury retired from service, the loading plant at Valcartier was almost completed. Under his direction, the enterprise had grown up almost in the wilderness and had developed into a hive of industry. He left

to his successor, Brigadier Thériault, an instrument which soon afterwards demonstrated its merits to the full.

In spite of very unfavourable circumstances, Colonel de Bury had maintained the whole establishment of the Quebec Arsenal in perfect order and had perfected it unceasingly, even making extensions when the budget made it possible.

In the course of 1924, several additions were made to the machinery and a small workshop was built connecting with the loading factory where machines were repaired from then on.

A power house was established in 1925 and the power in the Arsenal was redistributed, electric energy having been reduced from 890 to 450 horsepower. An hydraulic press of 1200 tons was installed in the plant and numerous additions were made to the factory on the Cove Fields. That year the Arsenal built two special Brinell testing machines for .303" cartridge cases and in 1926 the annealing furnace of the rolling mill was rebuilt. A low temperature furnace for the manufacture of quick firing cartridge cases was built and a new method of ventilation was adopted, while an acid-proof cement floor was put in and a new method was introduced to filter the water.

During the last years of the period 1920-30, the annual production of the Arsenal amounted to five or six million small arms cartridges.

Even in this darkest period, the equipment was not neglected, being maintained with greatest care and added to in several particulars. Electric furnaces were installed in the shell factory, the foundry and the workshop. A small foundry was built, near the carpenter shop, to melt scrap metal and to cast non-ferrous alloys. Plans were then prepared for moving the loading department to Valcartier and during the whole of 1035, the following year, this work went on, while new machines and other material were purchased.

It was while the old properties were thus being improved that the Valcartier Arsenal was born, with promise of becoming one of the greatest munitions production centres in the world.

Colonel de Bury may be proud of his work.

ON 9TH MAY. 1935,

THE HON. GROTE STIRLING. ASSOC. M. INST. C.E., M.E.I.C., M.P.

MINISTER OF NATIONAL DEFENCE

TURNED THE FIRST SOD COMMENCING THE ERECTION OF THIS SECTION

OF THE

DOMINION ARSENAL. VALCARTIER.

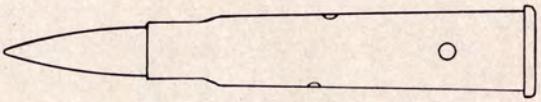
PER ARDUA AD REM.

GENERAL MCNAUGHTON
DURING A VISIT TO THE ARSENAL

THE PERSONNEL

Assistant-Superintendent: Major Antonin Thériault.

Ansell, G. N.
Armstrong, E
Bissonnette, W.
Bradley, R. A.
Cantin, F.
Cauchon, L.
Cornell, H. J.
Côté, P. Oscar
Couture, Calixte
Dussault, Paul
Egan, E.
Fortier, F.
Fuller, P. J.
Fleming, A. A.
Grenier, J. A.
Hannon, O. J.
LaRochelle, Jos.
Lemieux, G. H.
McGillicuddy, A. J.
Mignault, Chs.
Mecteau, J. P. H.
Newton, S. G.
Pakenham, Albert
Pakenham, George
Poirier, J. E
Rhéaume, J. A.
Ruthven, Miss E. M.
Sheppard, W. T.
Thibaudeau, Jos.
Turcot, Dr. G. G.
Young, E.



CHAPTER V

BRIGADIER ANTONIN THERIAULT

1936 to date

Brigadier A. Thériault, C.B.E., B.Sc., C.E., M.E., p.a.c., M.E.I.C., is a Civil and Mining Engineer and a member of the Engineering Institute of Canada. Born at Rimouski, after studies in the Seminary of that town he received in 1910 his diploma in science and engineering at the Montreal Polytechnical School. Soon after, he joined the Canadian Engineers at Ottawa with the rank of Captain. He had been a Lieutenant in the 85th Regiment of Rimouski since 1906. In 1915 he went overseas and served in England and France. He was mentioned twice in dispatches. In 1917, he was attached to the War Office and took the degree of p.a.c., in the College of Science at Woolwich. In 1920 he was named assistant to Colonel de Bury in the Dominion Arsenal at Quebec and succeeded the latter when he retired in 1936. Made Colonel in 1937, he was promoted to be Brigadier in 1942 and then made Commander

of the Order of the British Empire on the occasion of the distribution of New Year's honours. Laval University conferred the degree of Doctor of Science on him in 1944, and on August 8th, 1946, the United States Government made him an Officer of the Legion of Merit.

The Military Journal has paid tribute to Brigadier Thériault as a chief factor in the extraordinary output obtained from the Quebec Arsenal during the war.

The urgency of the task of developing the Arsenal to meet the emergency needs of the last war created congestion in the existing facilities and made necessary an extension of them to St. Malo and a considerable enlargement of the shops previously begun at Valcartier. The Dominion Arsenal thus became at once an immense munitions industry and a great training school in the manufacture of munitions in Canada for all technicians.

The productive capacity of the shops at St. Malo and Val Rose — Val Rose being the name of the Canadian National station built in the Municipality of Valcartier to serve the Federal Government Arsenal — quickly surpassed, and by a considerable margin, that of the former establishment, the old Arsenal on Palace Hill, which, however, remained the directing centre and retained the general offices of the Arsenal.

Certainly the Dominion Arsenal was able to supply a greater production in 1939 than at the beginning of the hostilities of 1914-1918, but it was called on to fill still larger orders. Accordingly, all the old machines on Palace Hill, some of which had been in existence for nearly a century, were placed in operation but the buildings which had never been intended for manufacturnig purposes were obviously unequal to the needs of the hour.

Thus it was that the Superintendent conceived the idea of acquiring the St. Malo shops at Quebec, which were the property of the Canadian National Railways. In close proximity to a labour supply both plentiful and sound, and, moreover, linked to the railways by an excellent system of sidings, these shops were admirably well placed for the manufacture and shipment of munitions. Their acquisition by the Arsenal was essential and expropriation was sought accordingly.

Strong opposition developed that continued for more than a year but the determination of the Arsenal authorities, vigorously supported by Honourable C. G. Power, won out in the end. The Member for Quebec South, who was at that time Minister for Air and Acting Minister of National Defense, took the project to his heart and spared nothing to assure its acceptance by the Federal and Municipal authorities. His vigorous interventions and the pleas of Major-General W. H.

P. Elkins brought final success. In July 1940, Honourable C. G. Power, as Minister of National Defense, signed the transfer of the shops from the Canadian National Railways to the Arsenal.

During these negotiations and changes in the St. Malo Shops and while the other Canadian industries were as yet only in a preparatory stage, the old Palace Hill Arsenal was the only one in a position to supply the Allies with the munitions that were indispensable to offering an ever-growing resistance to the enemy. The personnel, therefore, undertook an intensive production in order to meet demands that were ever more and more pressing and numerous. Special machinery was required. Frequently the Arsenal workers had to develop and construct these themselves according to certain special designs. Moreover, a large number of other machines were manufactured by private industry in accordance with specifications supplied by this establishment.

At the same time, the Arsenal experts were teaching the employees of industries of all kinds, that were engaging in the making of munitions for the first time, new shop processes. In a word, the personnel was subjected to an enormous strain.

It was with a view to meeting this continually growing demand that towards the end of 1939 orders were placed directly with American manu-

MR. KING VISITING THE ST. MALO SHOPS

facturers for the machinery and equipment necessary to the production of munitions. It was chiefly in 1940, however, thanks to the cooperation of The Citadel Merchandising Company of Montreal, that the greatest part of this machinery was turned out.

A considerable saving in time and money resulted from this centralization of supply in Canada. The principal collaborators were Hercules Press Limited, Toronto; Canadian General Electric, Quebec and Toronto; Canada Iron and Foundry, Three Rivers; Dominion Engineering, Montreal; Delamere & Williams, Toronto; Harrington Tool & Die Co., Ltd., Lachine; Adélard Soucy, Rivière-du-Loup; Ohio Tool Company, Cleveland; and lastly, Superior Steel Corporation, Pittsburg.

It was necessary that the equipment should lend itself to the incessant modification of calibres and types. Processes and machines had to be rapidly experimented with and developed rapidly as a preliminary to helping other producers of munitions to overcome their difficulties.

The administration, in other words, had to employ both boldness and prudence at the same time. The immense success achieved in the production of the .303" cartridge during the war speaks well for that boldness and that prudence. On every field of battle willing praise was given

to the quality of this Quebec product, as also to the promptness of deliveries made possible by an extraordinarily rapid output.

A like tribute was paid to the Quebec Arsenal by authorities of the United States on the occasion of the production of several millions of cartridges for American small arms. Before even receiving the tooling designs, the Arsenal was able to install a line of production whose output, in the opinion of experts, was of superior quality.

On the other hand, the experts agreed in recognizing that the economical production of the Quebec Arsenal saved a great deal of money for the Government of Canada and for Allied countries. In fact the advantages which the numerous improvements and processes developed in the Quebec Arsenal placed at the Government's disposal, were shared with the United Kingdom and other Dominions, as also with the United States, China and various resistance groups in countries that had been invaded by the Axis.

Here is an instance: the adaptation of tungsten carbide (carboloy) in cooperation with General Electric, to the production of tooling; this process which certainly increased efficiency tenfold, was subsequently adopted by most manufacturers. Other instances: the Quebec Arsenal was the first to employ the Gilding metal coating steel of The

MR. KING VISITING ST. MALO

Superior Steel Corporation in the production of bullet envelopes of all calibres: the first and the only one to produce the B-VII, under the direction of Mr. S. G. Newton. Still other instances: The Quebec Arsenal developed a better percussion cap for the 20- m.m. cartridge to replace the glazed board disc which, being too hard, broke the propellors of airplanes; also it produced a special cartridge to test the resistance of the steel helmets protecting our soldiers. And it was also the first and the only one so far to successfully develop an aluminum cartridge case of 20 m.m. calibre under the direction of Mr. A. A. Fleming.

The most eminent personages and the greatest authorities who visited the three groups of plants comprising the Dominion Arsenal admired its organization and operation.

Rt.-Hon. Malcolm NacDonald, speaking to newspapermen after a visit to the Arsenal, said: "What I have seen of Quebec's war effort has keenly impressed me, the volume and the quality of the work is most encouraging. The contribution made by Brigadier Theriault and his staff in the Quebec district is magnificent."

At the beginning of March, 1941, Hon. C. D. Howe, Minister of Munitions and Supply, recognized the quality of the work at the Quebec Arsenal in a message as follows: "I am most satisfied with

the work being done at the Quebec Arsenal. My visit has left me with a very clear impression that the work has been carried to a high degree of efficiency."

Sir Andrew Duncan, British Minister of Munitions and Supply, wrote after his visit to Canada: "I must confess the surprise that I felt in noting in the very heart of Ancient Quebec the thoroughly modern outfit of your Dominion Arsenal and your lay-out at Valcartier. The arrangement and the output of production have greatly impressed me."

Mr. S. C. Lloyd, Director of Du Pont de Nemours and Company, said after his visit: "I have never seen an ammunition plant like yours and I believe that my opinion would be confirmed by all our technicians."

The Chief Engineer of the British War Purchasing Commission, Mr. H. E. Clive, paid the following tribute in writing: "Your Arsenal is the most remarkable and the best equipped that I have ever visited. As you know, I have seen all the factories making munitions for small arms in the United States, as also in several other countries, and I can say with every assurance that the manner in which Quebec Arsenal has been established surpasses any other organization of the same kind."

At the beginning of the war, His Royal Highness the late Duke of Kent visited the Arsenal and showed himself extraordinarily interested in it.

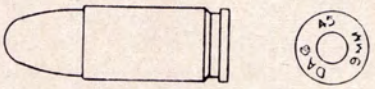
THE EARL OF ATHLONE,
PRINCESS ALICE AND LADY BYNG OF VIMY
DURING THEIR VISIT TO THE ARSENAL

A visit was also paid to the Arsenal by the Governor-General of Canada, His Excellency the Earl of Athlone, accompanied by Her Royal Highness the Princess Alice and Lady Byng of Vimy.

Rt.-Hon. W. L. Mackenzie King visited the Arsenal in order to see the new marvels of munitions-making and to convey to the workers the admiration of his Government and of the Canadian people for their excellent contribution to victory.

Among the other eminent visitors should be noted, in the chronological order of their visits: Rt. Hon. Ian A. Mackenzie, Minister in the Dominion Cabinet; Hon. J. L. Ralston, Minister of National Defense; Rt.-Hon. Ernest Lapointe; His Eminence Cardinal J. M. R. Villeneuve; His Honour the Lieutenant-Governor of the Province of Quebec, Major-General Sir Eugène Fiset; General H. D. G. Crerar; Major-General J. H. MacQueen, of the United Kingdom; Colonel Wang of the Chinese Defense Committee; Mr. Wm. A. Rockefeller of New York; Mr. Beaudry Leman of Montreal; Captain Marion Eppley, U.S.N.R.; Mr. E. S. Cushman of New York; Hon. Ray Atherton, United States Ambassador to Canada; Sir Graham Cunningham, British Minister of Munitions and Supply; J. G. Notman, Montreal; Rt. Hon. Louis St-Laurent Minister of Justice; Honourable C. G. Power, Minister for Air; Gen-

eral A. G. L. McNaughton, Rear Admiral E. W. Burrough, U.S.N.; Messrs. C. Fraser Elliott, Canadian Ambassador to Chili; L. D. Wilgress, Canadian Ambassador to the U.S.S.R.; His Excellency Monseigneur Georges Léon Pelletier; Rt.-Hon. Malcolm MacDonald, British High Commissioner to Canada; Hon. James A. MacKinnon, Minister of Trade and Commerce; Lt.-General J. G. Evetts of the United Kingdom and a number of others.

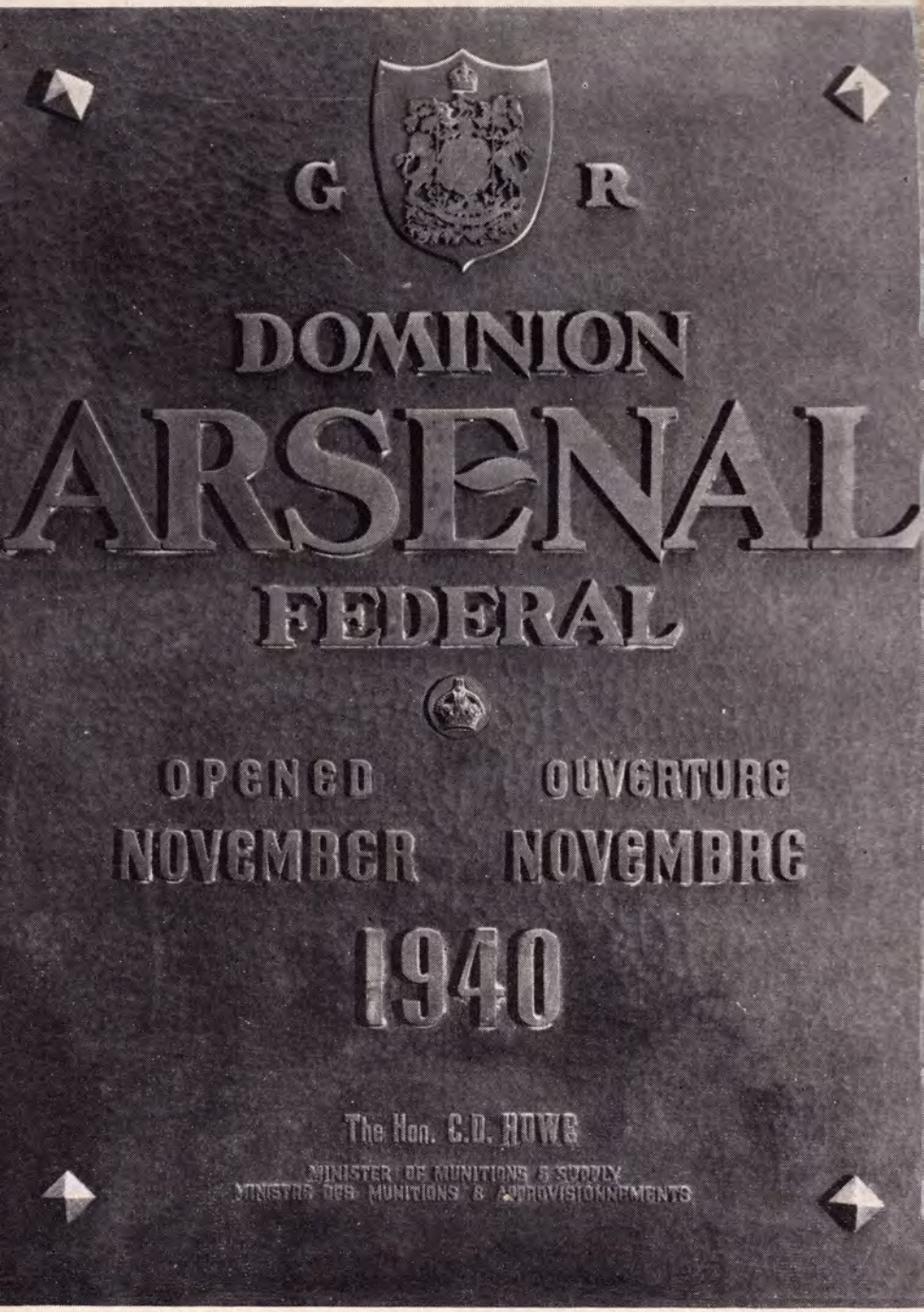


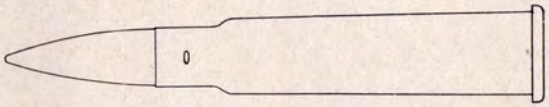
SECOND SECTION

QUEBEC GOES TO WAR

IN HOMAGE

TO THE MEN AND WOMEN WORKERS,
TO THE FOREMEN AND FOREWOMEN,
TO THE STAFFS OF THE FACTORIES AND OFFICES,
TO THE SUPERINTENDENTS, SENIOR OFFICIALS
AND MINISTERS
WHO HAVE CONTRIBUTED
TO UPBUILDING THE IMPORTANCE
AND THE EFFICIENCY OF THE
DOMINION ARSENAL
AT QUEBEC
AND WHO HAVE ENABLED IT
TO PLAY A PRE-EMINENT PART
IN TWO WORLD WARS.


G R
DOMINION
ARSENAL
FEDERAL
OPENED
NOVEMBER
OUVERTURE
NOVEMBRE
1940
The Hon. C.D. HOWE
MINISTER OF MUNITIONS & SUPPLY
MINISTRE DES MUNITIONS & APPROVISIONNEMENTS



CHAPTER VI

MANUFACTURING PROCESSES

Thus far we have been dealing with the origin and the development under five successive Superintendents that enabled the Dominion Arsenal to play a leading part in two World Wars, but the record would not be complete without some account of the manufacturing processes employed by and the internal management of the modern Arsenal that sprang into being, following the outbreak of hostilities in 1939, from the nucleus in existence at that time.

In October 1940, the Arsenal was transferred from the Department of the Minister of National Defense to that of the Minister of Munitions and Supply. In consequence, it became an institution unique in North America and even in the British Empire for its production methods. For this, a very special tribute is due to Rt.-Hon. C. D. Howe, Minister of Munition and Supply.

To attain the objective, Mr. Howe never hesitated an instant to direct with sage counsels and

to encourage everything calculated to make the production of the Dominion Arsenal still more efficient.

The value of the buildings and equipment increased from $1,250,000 to $45,000,000, and the production from the 3,000,000 cartridges annually, that it was before the war, to 3,000,000 a day.

The production of the .303" calibre alone attained to a value of $90,000,000, while the total production reached a value in excess of $150,000,000.

In addition to its munitions factories, the equipment of the Arsenal included:—

(*a*) A foundry and a rolling mill for the preparation of all alloys required in the manufacture of munitions;

(*b*) A tool room capable of supplying all the tools and all the gauges required in the enterprise;

(*c*) A machine shop in which all the machinery could be manufactured and repaired;

(*d*) A carpenter shop to produce the boxes required for all the different purposes of mafacturing.

HEAVY MUNITIONS

Although the Arsenal may have built up its chief renown on the remarkable success achieved

THE DUKE OF KENT, ACCOMPANIED BY
HON. C. G. POWER AND BRIG. THERIAULT

in the manufacture of small cartridges, its merits in the production of heavy munitions likewise must not be lost sight of.

It was in the Palace Hill Shops that the heavy calibre cases were manufactured first and later repaired by millions. The Quebec Arsenal was the first to produce heavy calibre cases in Canada. After having perfected the production of 25 and 18 pounder cases, the Management of the Arsenal directed private enterprises in the manufacture of millions upon millions of these heavy calibre cases.

In order to intensify to the maximum an output so indispensable to our armies, the Quebec Arsenal communicated at length with the management and the personnel of industries in a position to produce heavy calibre cases, once they had been brought in to this work. Its experts visited shops here and there while technicians came from all over to study the Quebec organization. Here there was manufactured during the course of the war, cartridge cases from two to twenty-five pounder, from 3 to 4.5 inches. Cases of the same calibres were repaired in thousands, while the d'Auteuil Street Shop turned out primers required for these cases.

The primers for the heavy calibre cases manufactured in the Quebec Arsenal were of great in-

terest to connoisseurs. Like all the other shops of the Quebec Arsenal, that on d'Auteuil Street, where these primers were prepared, turned out only products of superior quality.

SMALL ARMS MUNITIONS

The components of cartridges for small arms (except for the explosive material) were manufactured during the war on the site of the former Canadian National Shops at St. Malo.

The inauguration of the munitions factory took place in November 1940, and a bronze plaque commemorates the ceremony.

A former employee of the Canadian National Shops would have difficulty in recognizing the St. Malo establishment which was considerably enlarged and completely renovated. From about 100,000 square feet, the floor area was increased to more than 1,000,000 square feet.

The transformation of the raw material into cartridges involves a series of very interesting industrial operations. It necessitates the use of amazing machinery and also of a highly competent personnel.

THE .303 CARTRIDGE

The great specialty of the Quebec Arsenal being the .303" cartridge (that is to say, the cartridge

RT.-HON. MALCOLM MACDONALD
AND MR. ROLLIN R. WINSLOW VISITING ST. MALO

adapted to arms having a diameter of .303"), a description of the manufacturing process of this ammunition is likely to be of special interest to readers of the present monograph.

Firstly, like all cartridges, the .303" is composed of a case, a cap contining the fulminate mixture, a propellant explosive and a bullet.

It is the manufacture, processing and assembling of all these constituent parts of the cartridges that will be dealt with in the following pages.

Copper and zinc are received in a pure state. Chemists analyze these metals in order to check their properties, on the basis of which they are accepted or rejected. After being accepted, the metals are taken to the foundry where the alloy of copper and zinc is cast.

Emerged from the foundry, the metal in ingot form is now a brass alloy that the chemists analyze to check its properties. When this inspection is completed the metal passes on to the rolling mill.

When they enter the rolling mill the ingots measure three feet long by three-quarters of an inch thick. They are more or less flattened and drawn, according to the calibre of ammunition to be produced. In order to do this they are passed through the rolling mill several times and,

in the course of being drawn out, they are annealed in order to soften them and are washed in sulphuric acid.

Once the metal has been reduced to the desired thickness it is annealed once more, washed and polished with wood sawdust. Next, the samples are sent to the Physical Laboratory for analysis and checking of properties.

After being accepted by the chemist, the metal goes to a department where it is disced and is given the form of a cup, the same machine performing the two operations.

From the rolling mill the metal is now taken to the cartridge factory where the case is made.

THE CASE

In the cartridge factory the cups are annealed, washed with acid and then the first draw is made. There are three other draws with annealing, washing and testing of samples in the laboratory. After the second and the fourth, the so-called indenting operations are carried out, then the formation of the head which is the bottom of the case and finishes with a bulge.

After the formation of the head comes the operation of piercing the fire-holes, those two small apertures through which will pass the priming

spark that ignites the cordite in the case at the moment of firing.

The body of the case is next heated with gas in order to permit of tapering and the hammering-out of the upper part, called the mouth, in two operations.

The height of the anvil, the eminence which the firing-pin of the arm will strike at the moment of firing, is next checked and corrected if necessary.

To remove the copper oxide deposited on the cases in the course of the different annealings, they are washed in a bath of acid and of soda.

Next comes the turning of the head and the trimming of the case at the mouth to the necessary length.

The case is finished.

It is sent for inspection, where it is measured by a machine and undergoes a final check before going on to the loading factory at Val Rose.

THE BULLET

The bullet is the projectile placed in the cartridge case. The first process in the rolling mill resembles that of the case and of the cap.

When it reaches the bullet department, the metal undergoes three draws and a single annealing.

When it has been cut to the proper length, the bullet is given a pointed shape at one of its extremities, then it is filled, first with aluminum and then with lead so as to place the centre of gravity in the rear. When the bullet has been thoroughly filled, it is closed at its base by a double bending operation.

Next a canneluring is made around its exterior, a little above the base, in order to attach the case to it. Then its diameter is rectified and its identification mark is engraved.

The final operation is the polishing with sawdust in a drum which is given a rotating movement.

When it has been finished, the bullet passes to the Inspection Department for checking and for final gauging before going on to the loading factory at Val Rose.

It is the manufacturing process of the rgeular .303" cartridge that has been explained above. Although, this munition is the great specialty of the Arsenal it also turned out cartridges of the following calibres: .303" armour piercing, incendiary, tracer, blank; .55" armour piercing and those for gallery practise; 30m.m. hispano and oerlikon; the 9m.m. regular; the 5" armour piercing.

THE CAP

The cap which is produced at St. Malo is a small cup containing the fulminating composition

VAL ROSE

and is placed in the head of the case. It is made of copper, but of an alloy different from that of the case. Except with regard to the dimensions, the work of rolling is about the same for the cap as for the case. The strips are sub-divided and then punched into caps in the course of a single operation.

The filling of the cap is done at Val Rose and necessitates three very delicate operations:

(1) the mixing of the composition,

(2) its insertion in the cap,

(3) its compression in the cap.

Seven ingredients enter into the mixture that constitutes the cap composition of the .303" cartridge, one of which is the terrible mercury fulminate.

Scales of the utmost precision weigh the quantities of the ingredients intended for this mixture, which is made in a small vessel called the "jelly bag".

The composition is next distributed in the caps by highly perfected machines that reduce the manual labour of the men and women workers to the minimum. Once they have been filled, the caps go forward to other machines which press the

composition and cover it with a disc of paper, carton, tin, etc. according to the kind of cartridge.

THE ASSEMBLING

The cap is inserted into the chamber made for that purpose in the head of the case, in two consecutive operations. When the cap has been well fixed in the chamber, needles colour the border with shellac dye so as to identify the cartridge and, at the same time, to protect it against humidity.

The cartridges are then taken to the loading department where they receive their charge of propellant powder: cordite for the .303" cartridge and smokeless powder for the 9 m.m. cartridge destined for China during the war.

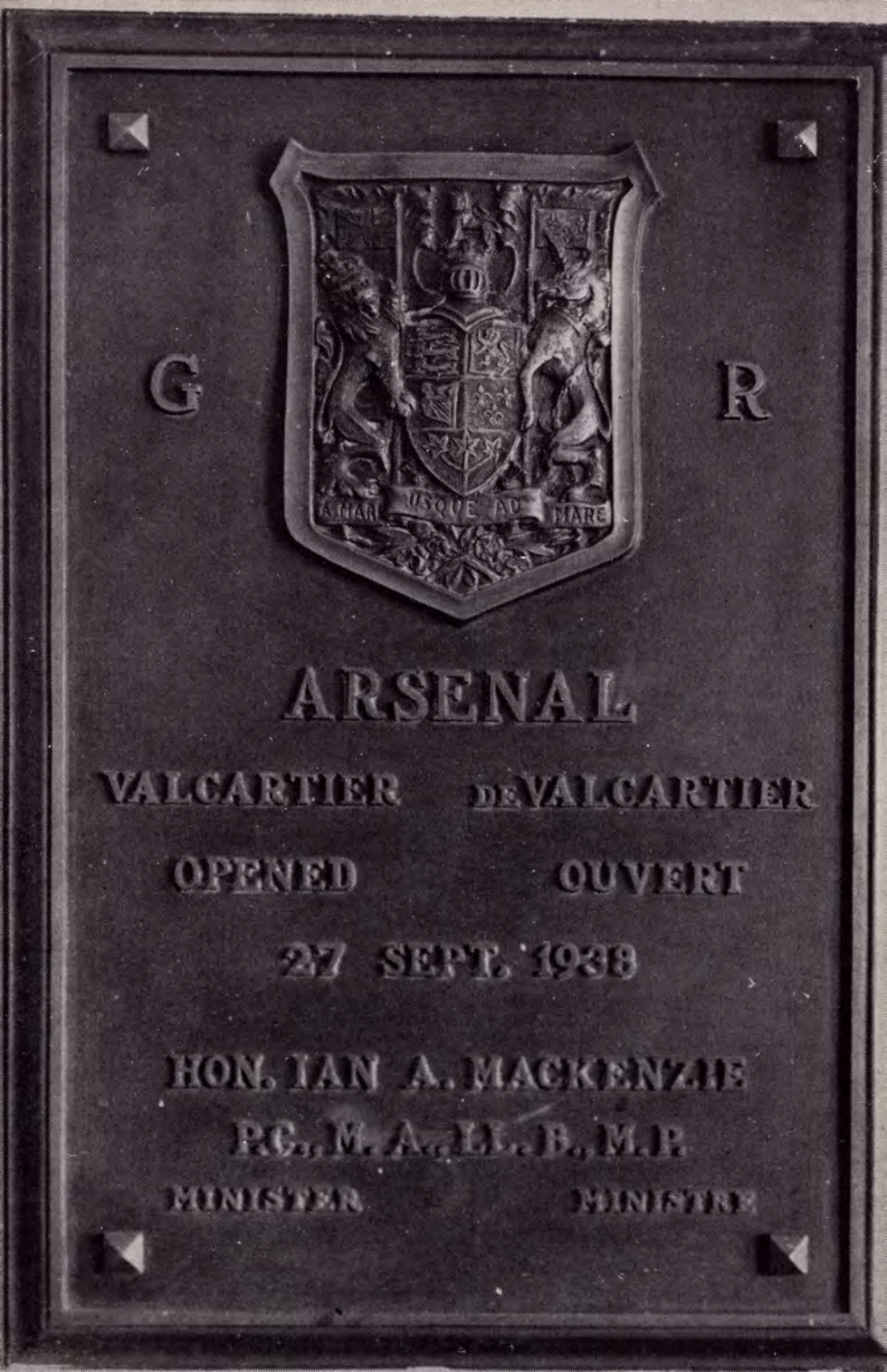
The moment has now come to place the bullet in the case. After shaping the neck of this last, the bullet is placed in it, its cannelure covered with wax and is pushed down as far as the carton covering the explosive. Three indentations are next made in the case, corresponding to the cannelure of the bullet, in order to fit one closely into the other.

Although various partial inspections have taken place in the course of the assembling, the cartridges are finally inspected by samples before being packaged.

A QUALITY PRODUCT

With their efforts seconded by a staff of twenty technicians, the Chemist and the Chief Metallurgist of the Arsenal supervise with close attention the quality of everything that is used even indirectly in the manufacture and shipment of munitions: raw materials, water, oil, silk, etc. The exceptional quality of the raw material employed in the manufacture of Canadian munitions to maintain the high reputation that our country has won, thanks to the excellence of the work done in its workshops, cannot be too much insisted upon. It may be affirmed, therefore, that the Chemical and Physical Laboratories are vital points in the Arsenal.

THE C.N.R. SHOPS AT ST. MALO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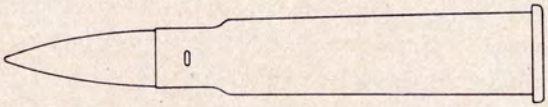
27 SEPT. 1938
HON. IAN A. MACKENZIE
P.C., M.A., LL.B., B.C.L., M.P.
MINISTER MINISTRE



CHAPTER VII

INTERNAL MANAGEMENT

The processing of the heavy and small arms munitions involved numerous problems of internal management that were met and solved with boldness and initiative.

The principal machine shops during the war belonged to the St. Malo group. In fact the St. Malo shops manufactured all the tools and even the checking apparatus used in all the plants of the Arsenal. They produced and improved instruments, presses, punches and moulds for the different phases of the production of munitions.

At the beginning of the war there had been hardly fifty employees in the machine shops, which occupied only a limited space in the establishment on Palace Hill. At the peak of production, the St. Malo machine shops employed 1,500 workers, 600 of whom were girls.

During the war, the expert machinists of the Quebec Arsenal often came to the assistance of the staffs of other Canadian munitions factories.

TRANSPORT OF WORKERS

It was at Val Rose, quite close to the Valcartier camp and seventeen miles from the St. Malo Shops, that the Quebec Arsenal completed the manufacture of its cartridges by filling the caps, then assembling and packaging those munitions.

The transportation of the workers who for the most part lived at Quebec, presented a problem. The Arsenal authorities solved it by organizing, in close collaboration with the Canadian National Railways, trains that brought them from Quebec to the door of the plant at Val Rose. The workers had to pay nothing, the Arsenal meeting the entire cost, and the success of this move prompted other plants of a similar character to adopt the same system.

The Val Rose shops covered an area of a million square feet. They were organized so as to be completely self-sufficient. The corner stone was laid May 9th, 1935, and the work had already been done to a large extent, as we have seen, by some 2,000 labourers who, at that time, were victims of unemployment.

At the peak of production, eighty million cartridges went out from Val Rose each month, or a

quantity one hundred times greater than during the war of 1914; while the termination of hostilities prevented the realization of projected improvements to increase the output to one hundred million a month. Moreover, it did the filling of heavy calibre cases and shells.

FEW ACCIDENTS

The operations of loading the cartridges involves handling the most dangerous explosives: T.N.T. for shells, cordite for the cartridges and some shells, smokeless powder for certain small arms and mercury fulminate for the cap composition. The fulminate is extraordinarily sensitive; the smallest impact sets it off and the explosion is heavy.

Accordingly, nothing was neglected at Val Rose to protect the workers. In order to gain some idea of the conditions, one would have to see them for himself but the precautions taken produced results. The directing heads of the Arsenal, in fact, congratulate themselves, and with reason, that not a single fatal accident occurred at Val Rose during all the war years of extraordinarily intense production. This record greatly astonishes those who are familiar with the tragic history of the manufacture of munitions throughout the world.

There were certain tasks that the Arsenal Management entrusted only to persons who offered

the greatest guarantees, both as to prudence and to self-control.

In this atmosphere of imperative caution, the workers themselves naturally entered into it.

INSPECTION DEPARTMENT

Thanks to the close supervision of the Inspection Department (which did not include more than 50 persons in 1939 and numbered not less than 2,000 afterwards), the munitions of the Quebec Arsenal have been classified everywhere and at all times in the high-quality category. Moreover, it is known that the methods used in the inspection service of the Quebec Arsenal served as a model for all the other Canadian munitions plants.

THE DIESEL MOTORS

The Arsenal purchased from the Quebec Power Company the electric energy needed for its plants. But, since production could not be subjected to any interruption at the least break in the outside lines, the installations included two powerful diesel motors that could be set going at need.

THE AUXILIARY SERVICES

The auxiliary services: the canteens, the social service organization and the clinics, must be mentioned.

SIR ANDREW DUNCAN AND RT. HON. C. D. HOWE VISITING ST. MALO

The canteens at Val Rose and at St. Malo were about the same. The first was inaugurated in August 1939 and the second in October 1941. One would have to go far to find as successful an organization of this character. For the very modest sum of fifteen cents, the canteens served soup, an entrée with vegetables, a dessert, bread and butter, and a beverage, all of the highest quality.

The men and women workers were allowed to have two helpings of meat, potatoes and vegetables, without extra charge, if they so desired.

Each week during the war, the list of supplies included some 13,200 pounds of meat; 4,600 pounds of choice beef, 4,200 pounds of veal and 4,400 pounds of first-quality pork.

About twice a month, for special dinners, chicken or turkey were served, and this amounted to some 10,000 pounds of chicken and 11,000 pounds of turkey, in all.

The dairy delivered, daily, 300 gallons of milk in cans and 1,000 gallons in pint bottles. The order for eggs averaged 664 dozen a week. 700 fresh loaves of bread went into the canteen daily.

What was aimed at was a balanced and varied diet. The menu was changed every day and

there was often an interval of three weeks before the same dish reappeared on the table.

THE HUMAN FACTOR

As much as hunger or an unbalanced diet, worry can undermine morale and reduce the output of the workers. The Arsenal therefore endeavoured to assist its men and women workers with their personal problems by organizing a social service during the war, which collaborated with Civic and Government Social Welfare Agencies.

Often a friendly visit and frank talk suffice to improve a complicated domestic situation and to restore the steadiness of men and women workers.

Increased from 25 in 1881 to 929 during the first World War, and to 14,000 (of whom 8,000 were women) during the late conflict, the staff of the Arsenal constituted a human agglomeration worthy of solicitude. It was precisely this attention paid to the staff and, at the same time, the moral value of these excellent men and women workers that placed the Quebec Arsenal at the head of the world arsenals.

95 percent of the members of this staff were French-Canadians, and 80 percent came from the Quebec district. In several cases, five or six members of a single family worked at the Arsenal.

From top to bottom, the spirit was excellent. All vied with each other in doing their work perfectly, so as to contribute to the victory that Providence has seen fit to give us as a reward for our faithful efforts.

A remarkable fact is that, during the course of all these years, not a single labour difficulty developed. The workers constantly enjoyed cordial relations with their foremen and superiors, as also with all the officers.

A frank and honest comradeship united all these servants of a great national and human cause.

The Arsenal encouraged sports: soft-ball, hockey, skating, swimming, bowling, etc.

At each of the three plants, there was a well-equipped clinic that might even be called a small hospital. In these, every necessary care was lavished under the direction of the Chief Medical Officer and a physician, assisted by trained nurses.

THE MINISTRY OF FINANCE

The Federal Arsenal of Quebec could not have fully performed its task without the constant support of the Ministry of Finance and its Treasury Office, which lavished services of every kind upon it.

THE IMMEDIATE HELPERS

If, since 1881, the Arsenal at Quebec has never ceased to progress; if, in the course of the Great War, it was able to play its part as the great purveyor of munitions to the Armies of Civilization and of Liberty; it has been because its directing heads and its whole staff have been, at all times, equal to every demand made by the task.

So, as the crowning feature of this monograph on the Arsenal at Quebec, it is fitting to publish the names of the men and women who, under the direction of the Superintendent, helped by their competence and generosity to supply our armies plentifully with the best munitions in the world.

COLONEL H. S. KIRBY,	O.B.E., p.a.c., B.Sc., Assistant Superintendent.
NEWTON, S. G.,	Mechanical Engineer, Director of Technical Developments.
FLEMING, A. A.,	B.Sc., Chief Director of the Chemistry and Metallurgy Laboratories.
FORTIER, Dr. J. EMILE	Chief Medical Officer, Professor at Laval University and member of the Royal College of Physicians of Canada.
RUTHVEN, E. M.,	Private Secretary.
LABERGE, H.,	A.P.Q., M.I.R.A.C., Chief Architect.

CHAPTER VIII

THE STORY IN PICTURES

CÔTÉ, P. OSCAR,	Assistant Executive.
DUCHENE, T. F.,	B.Sc., Head of the Inspection and Ballistic Office.
KANE, J. A. J.,	B.A., B.Sc., D.Sc., Director of the Department of Chemistry.
CANTIN, I.,	B.A., B.Sc., M.Sc., Director of the Metallurgy Department.
BUSQUE, D.,	B.A., B.Com., C.G.A., Director of the Accounting Department.
GRENON, R.,	Head of the Machine Shops.
GENEST, A.,	Head of the Tool Shops.
COSTIN, Mrs. J.,	Director of Canteens and Social Service.

The officers responsible for equipment, production and administration of the three plants are as follows:

AT ST. MALO

Lieutenant-Colonel Georges Couture

AT VAL ROSE

Mr. P. J. Fuller, T.D., Manager

AT PALACE HILL

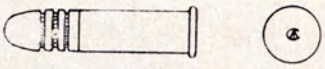
Mr. Joseph Thibaudeau

The names of the Heads of Departments will be found in an appendix.

The best general staff would lose wars if they were not powerfully supported by valiant soldiers. In the same way, the Quebec Arsenal would not have figured so worthily among the artisans of victory if its workers had failed in their task, but God be thanked, the moral, intellectual and physical faculties of this immense personnel assured complete realization of the boldest plans conceived by their leaders.

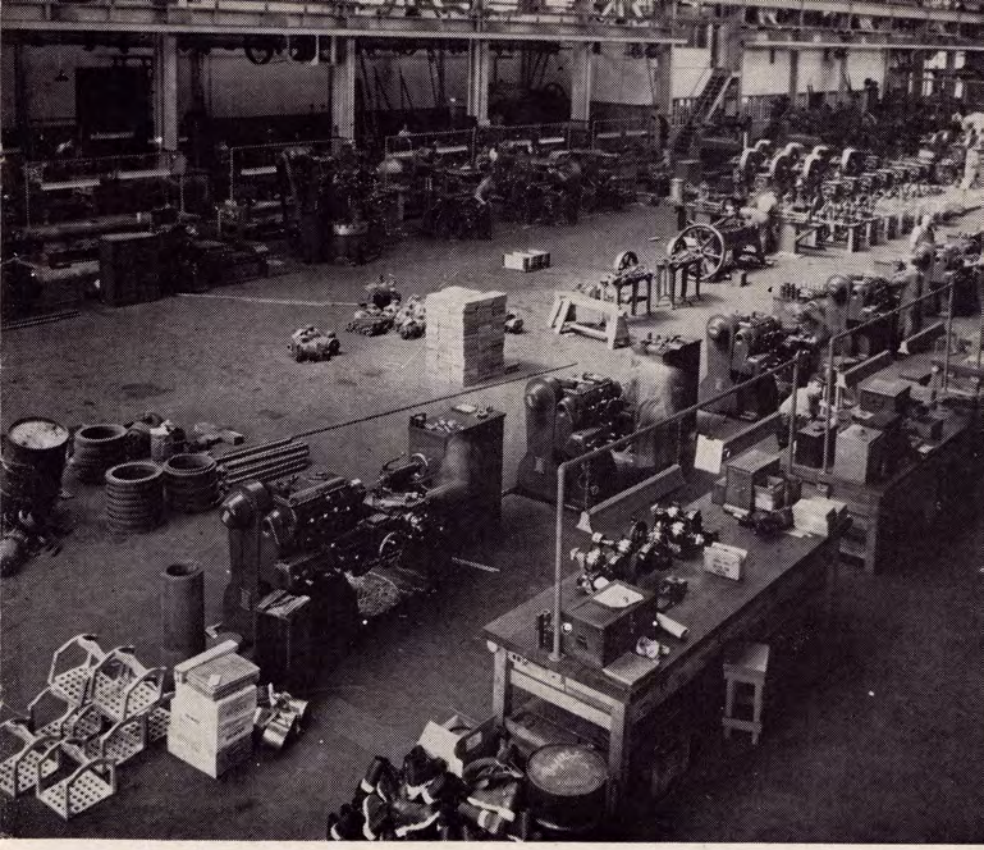
V.E. Day . . . . . May 8th, 1945

V.J. Day . . . . . August 15th, 1945

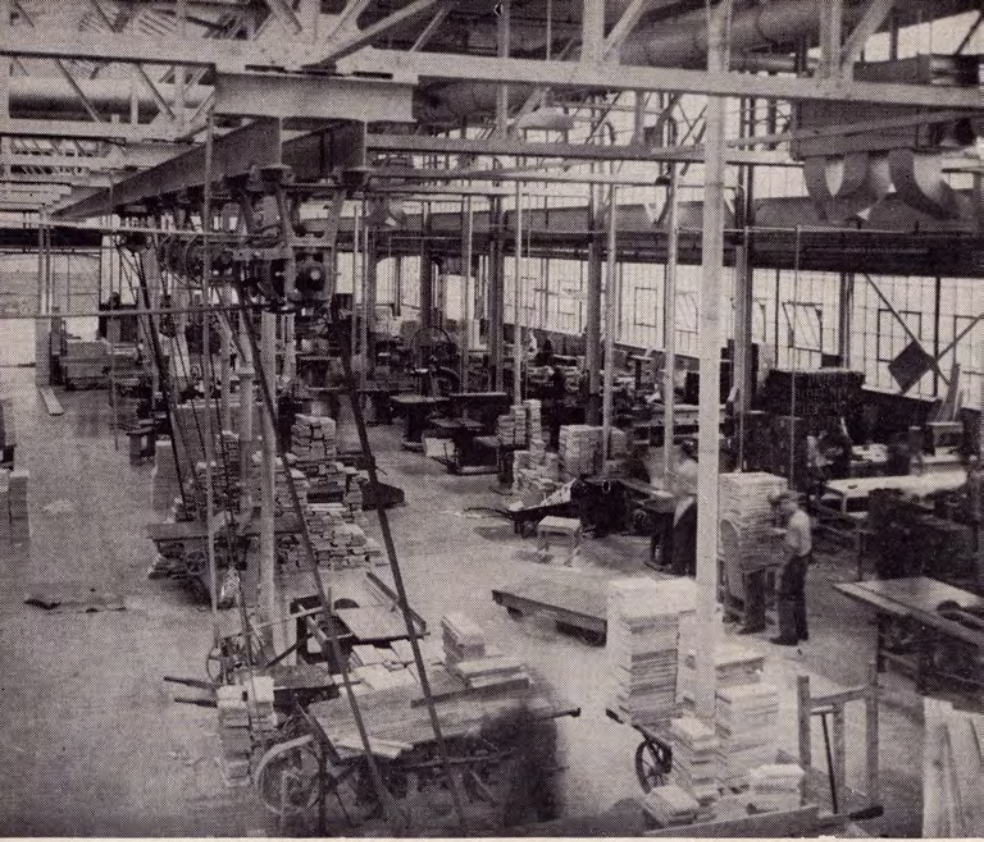


VARIOUS SHOPS

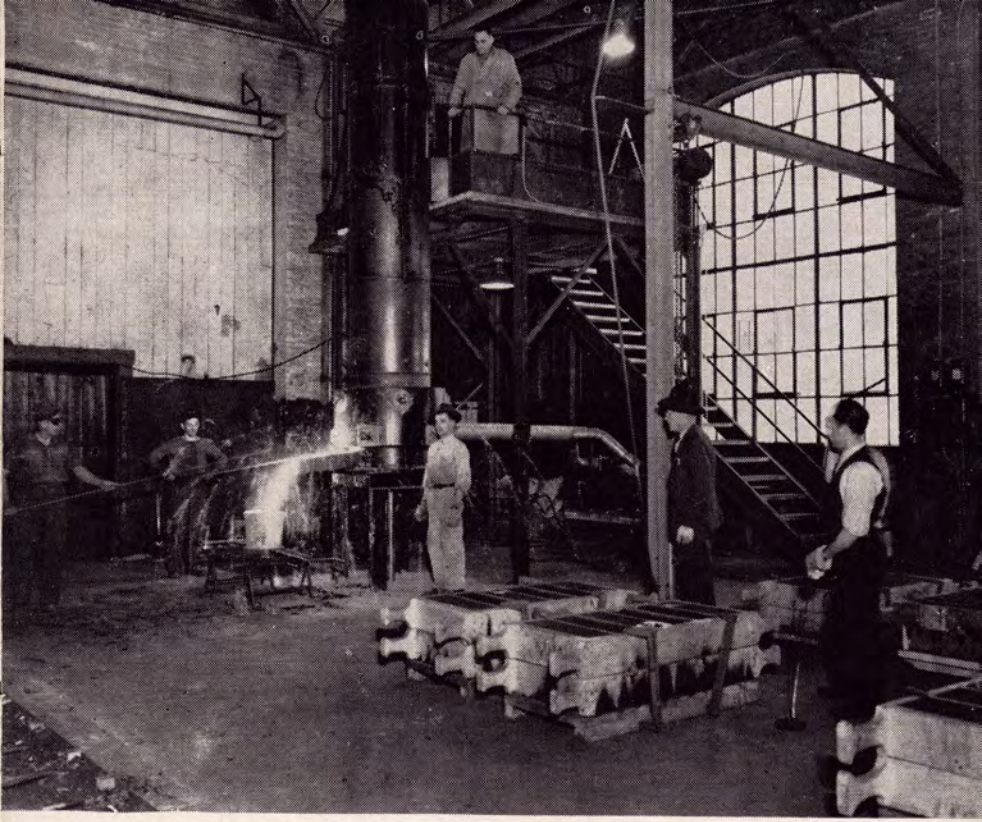
THE ST. MALO TOOL ROOM



THE ST. MALO MACHINE SHOPS

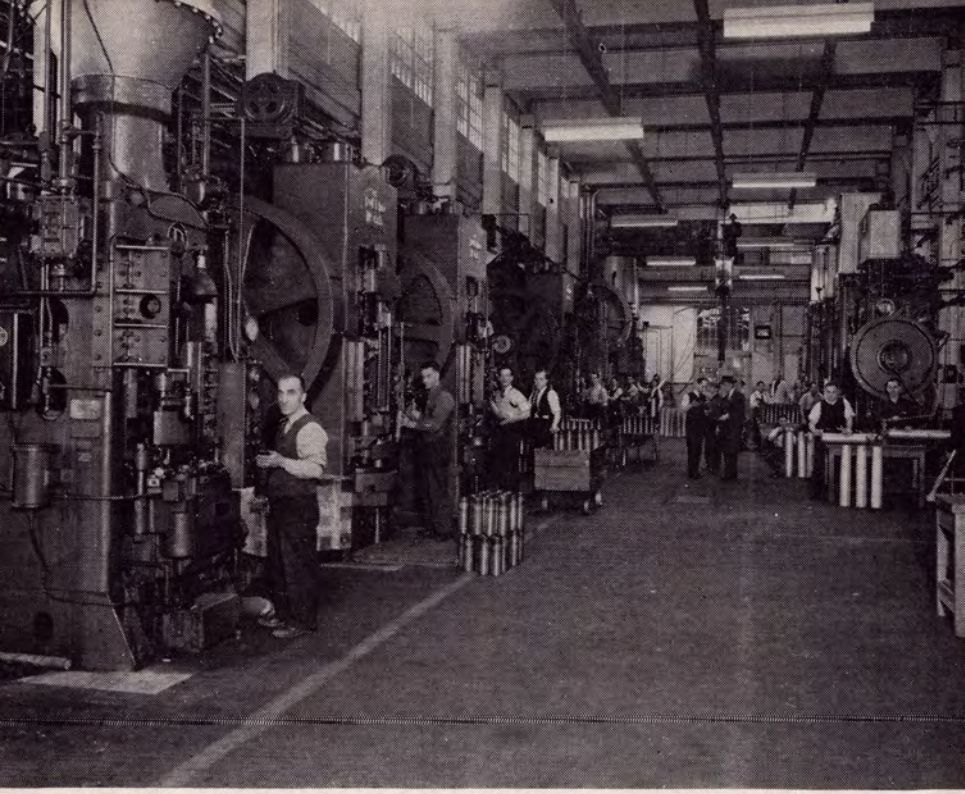


THE ST. MALO CARPENTER SHOP

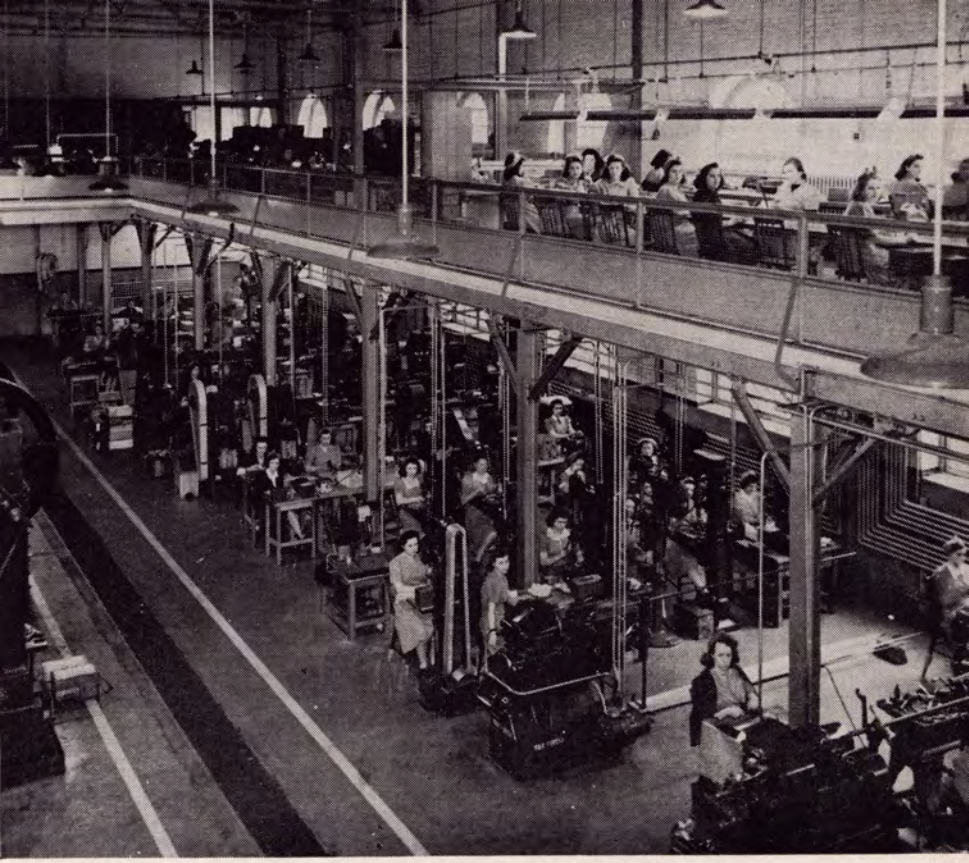


THE ST. MALO CUPOLA

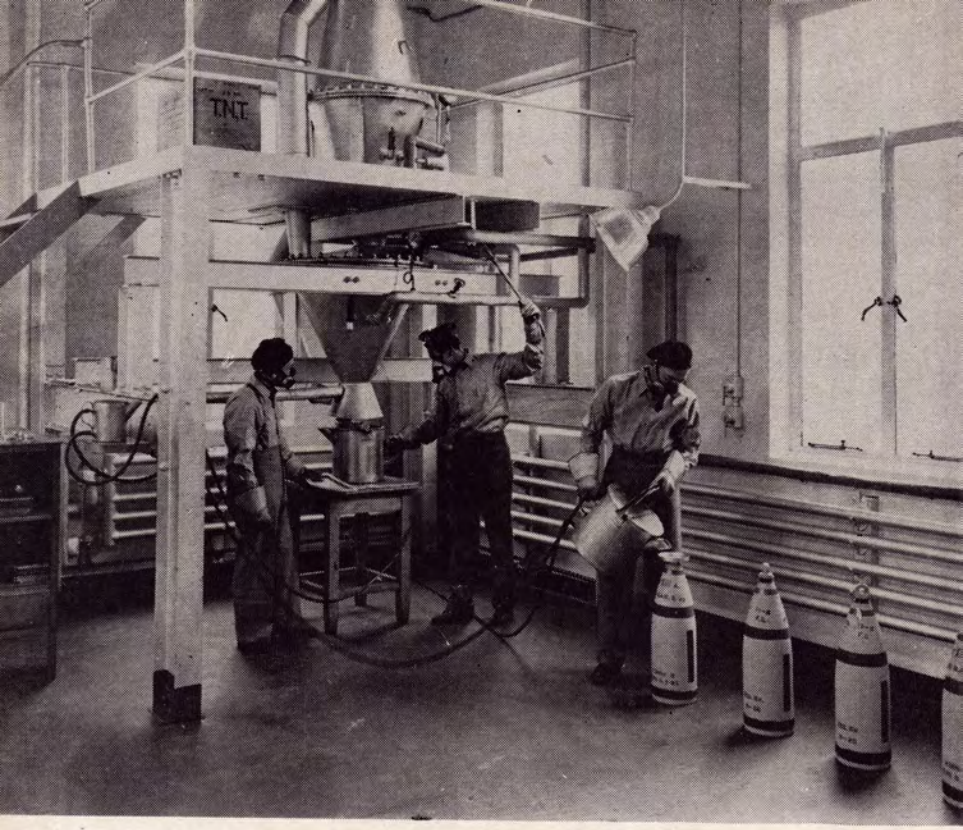
HEAVY MUNITIONS



THE PALACE HILL SHOP
FOR THE MANUFACTURE OF HEAVY MUNITIONS



THE MANUFACTURE OF PRIMERS
AT D'AUTEUIL STREET



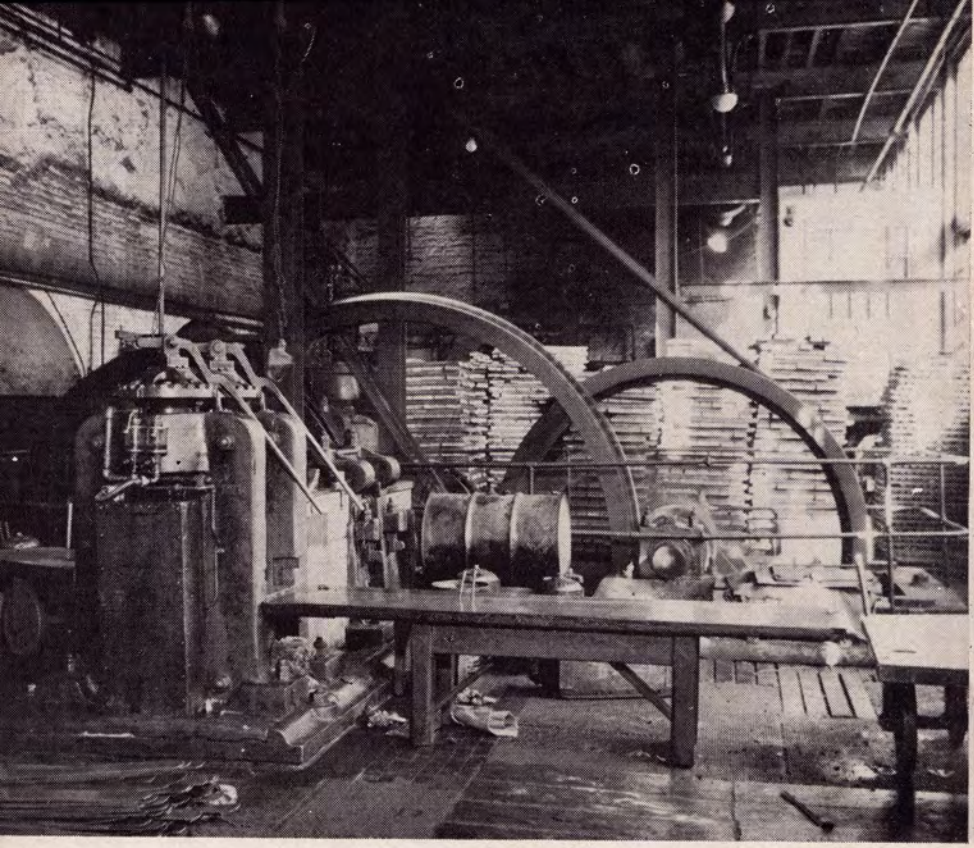
THE FILLING OF SHELLS

FILLING HEAVY CALIBRE CASES

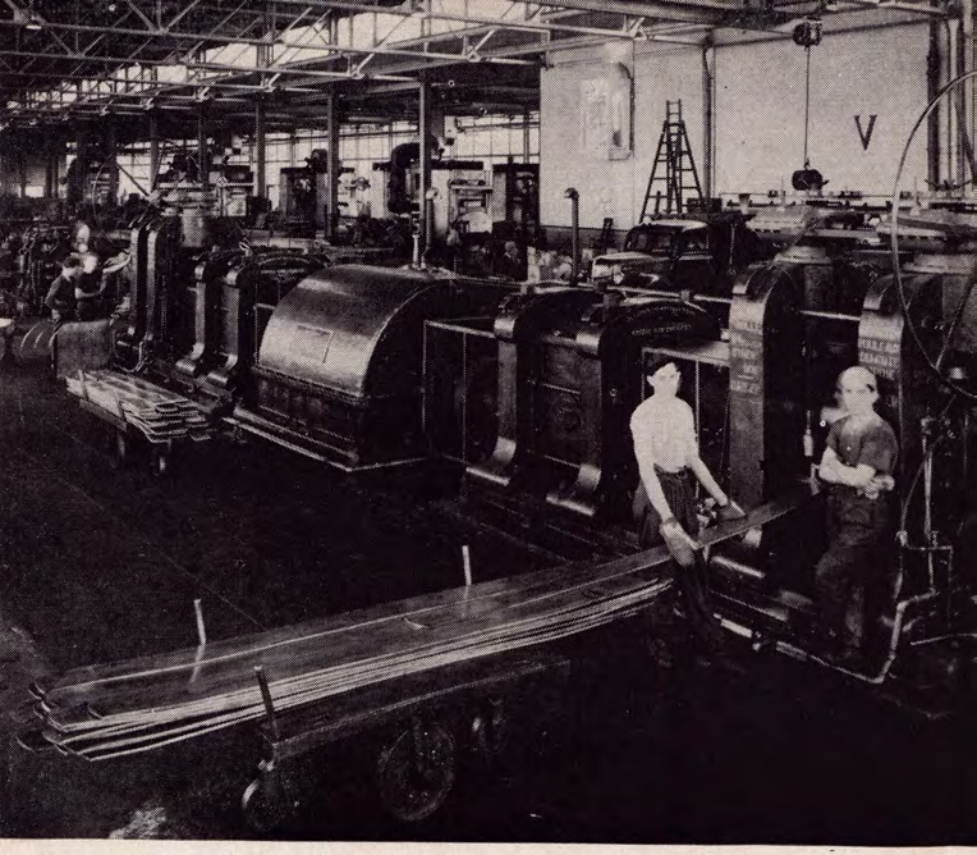
SMALL ARMS MUNITIONS

THE OLD FOUNDRY
(IN USE UP TILL 1941)

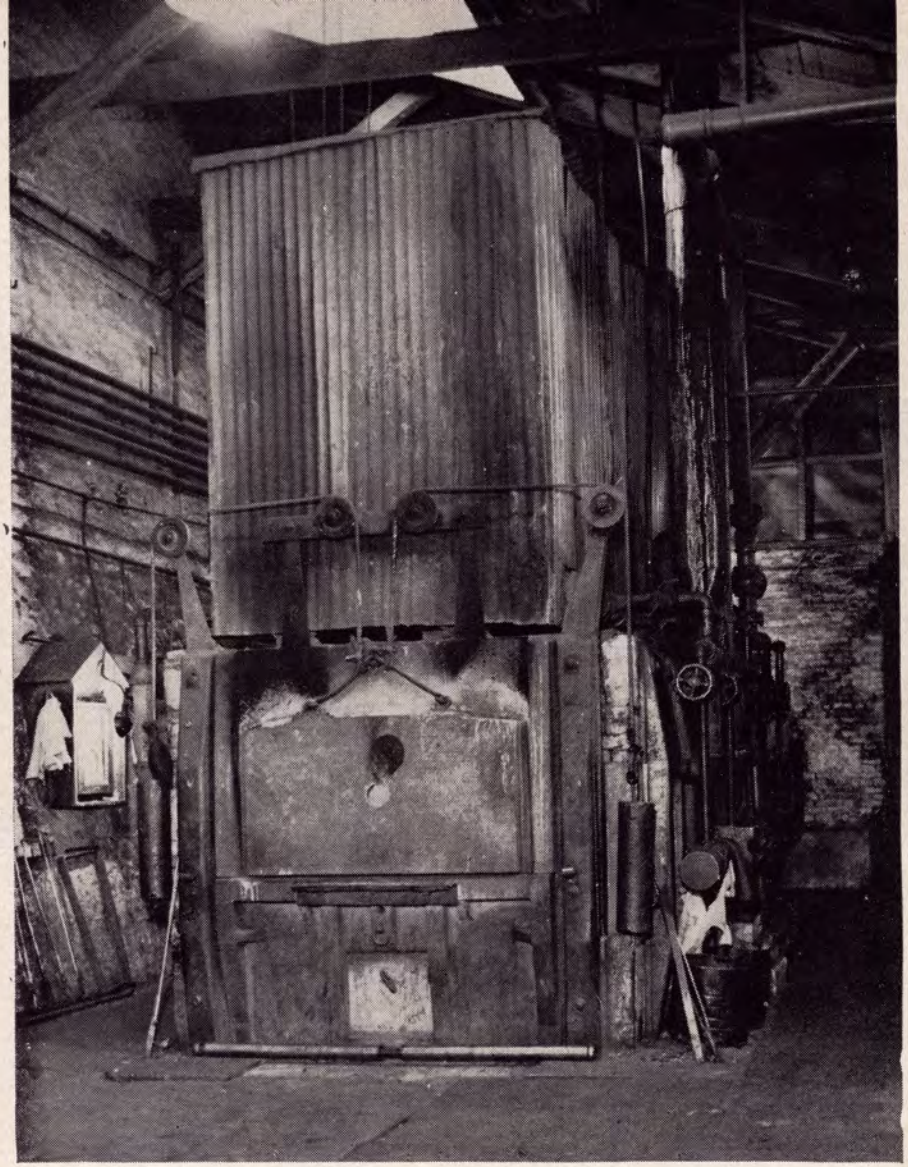
THE PRESENT-DAY ST. MALO FOUNDRY



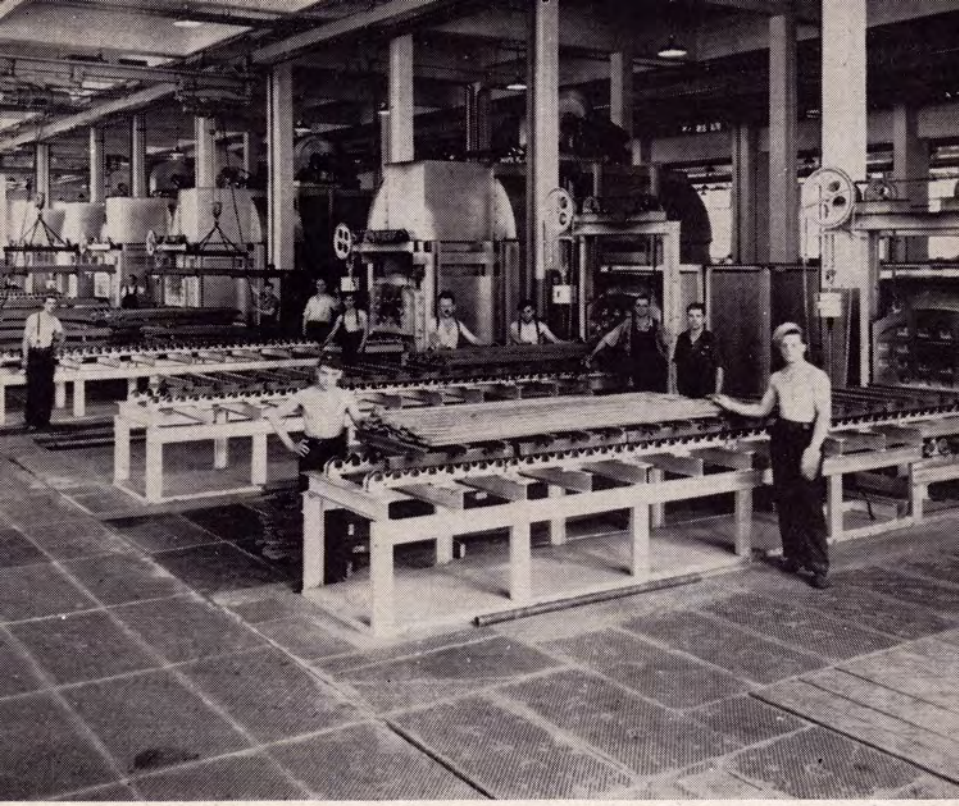
THE OLD PALACE HILL ROLLING MILL
(IN USE UP TILL 1941)



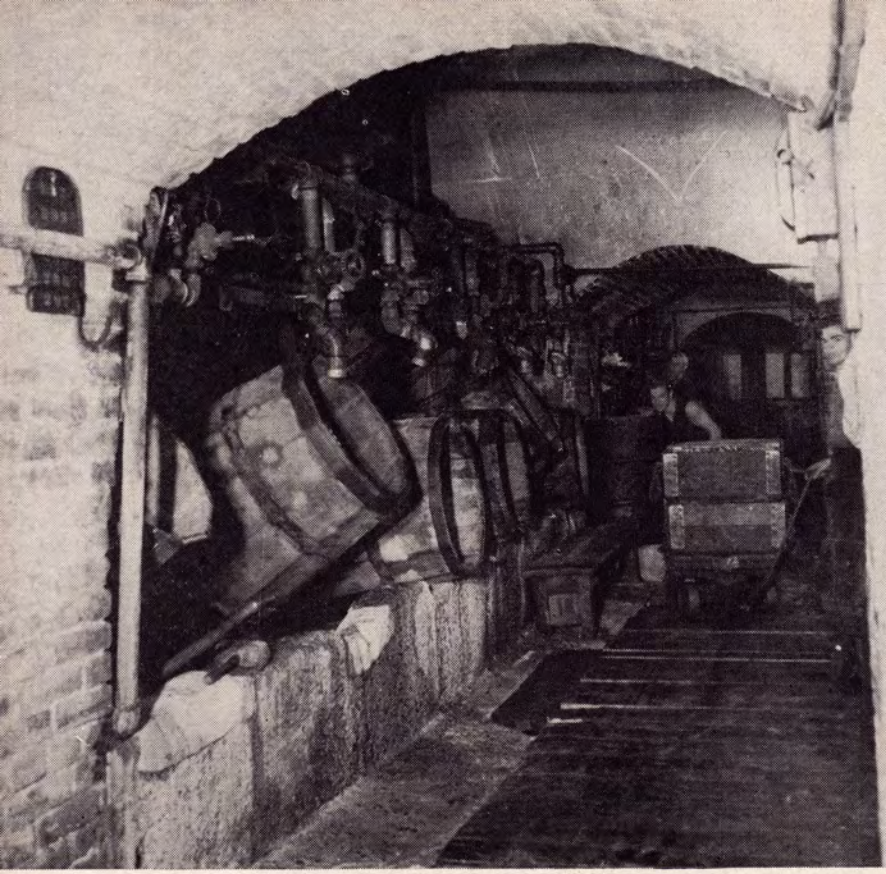
THE PRESENT-DAY ST. MALO ROLLING MILL



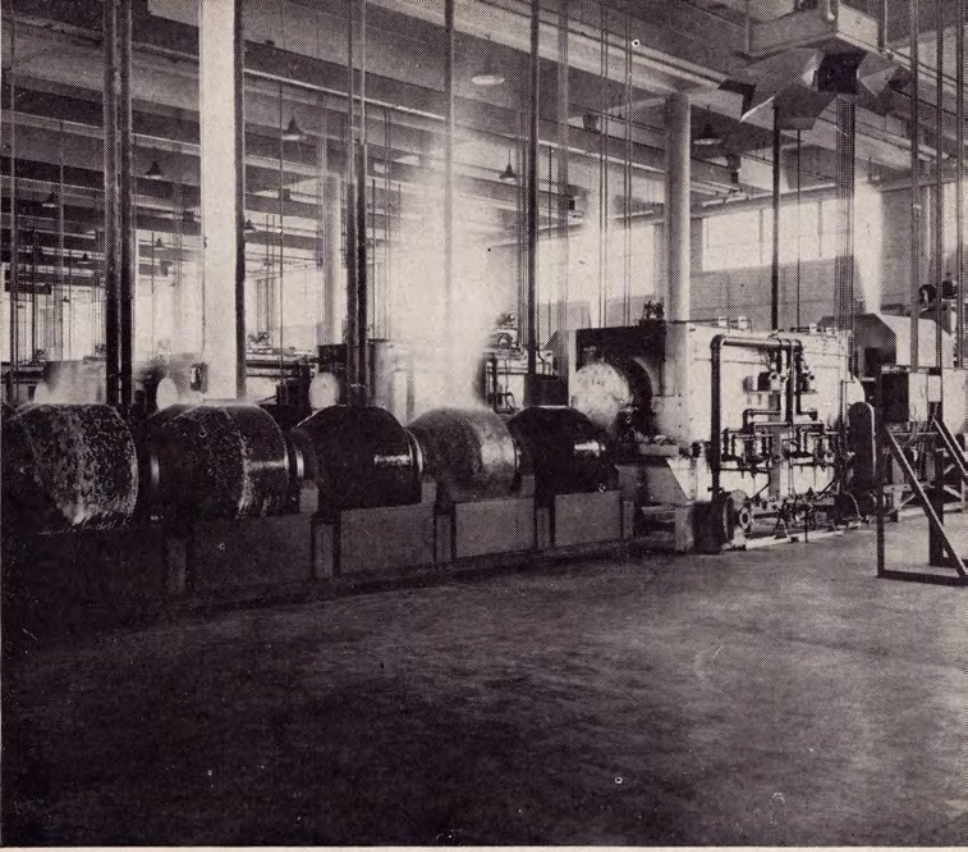
THE ANNEALING FURNACE
OF THE PALACE HILL ROLLING MILL
(IN USE UP TILL 1941)



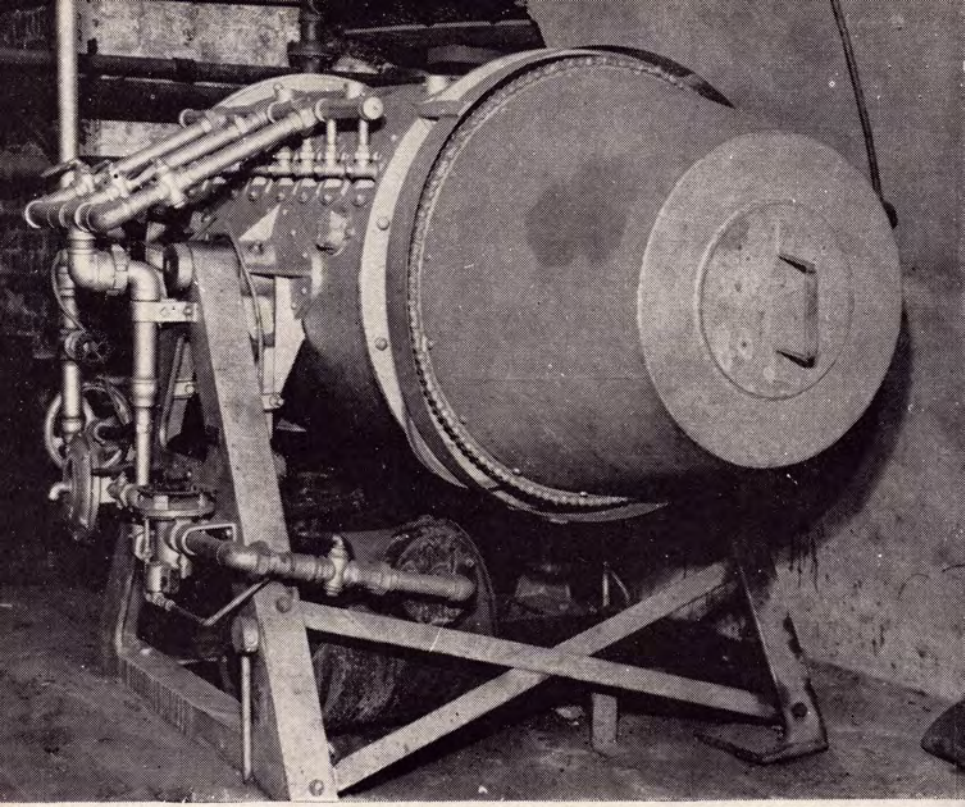
THE PRESENT-DAY ANNEALING FURNACES
OF THE ROLLING MILL AT ST. MALO



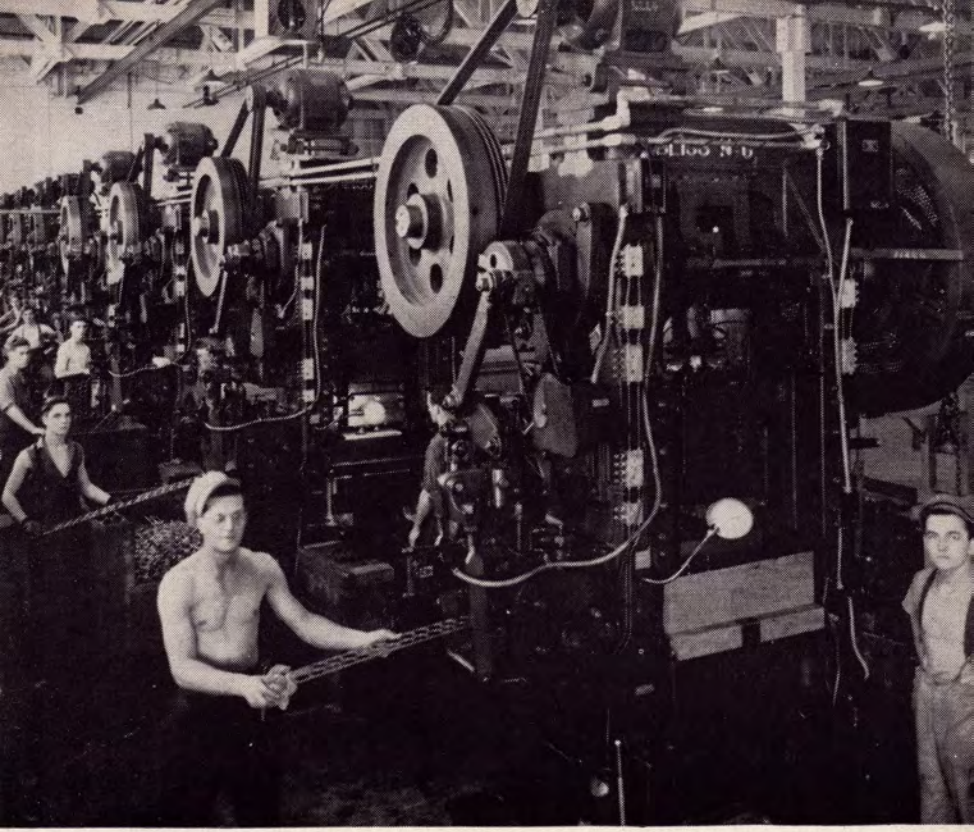
THE PALACE HILL WASHING ROOM
(IN USE UP TILL 1941)



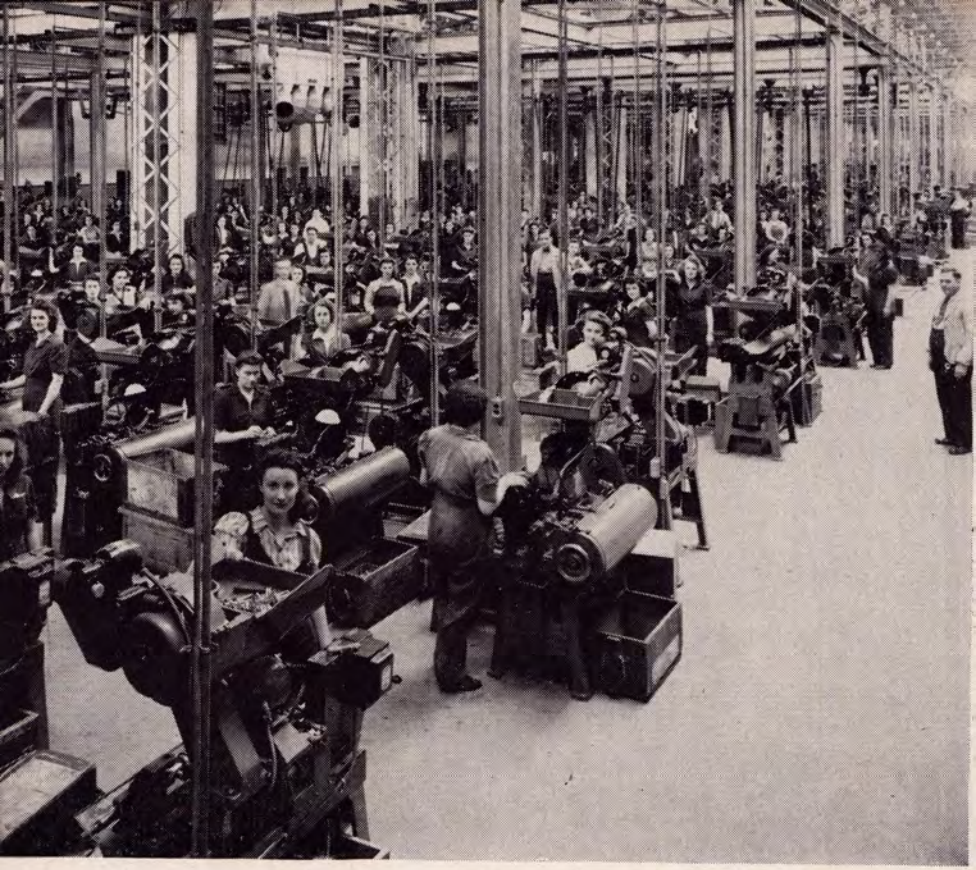
PRESENT-DAY ANNEALING FURNACES AND WASHING MACHINES AT ST. MALO



ONE OF THE ANNEALING FURNACES
OF THE PALACE HILL CARTRIDGE FACTORY
(IN USE UP TILL 1941)

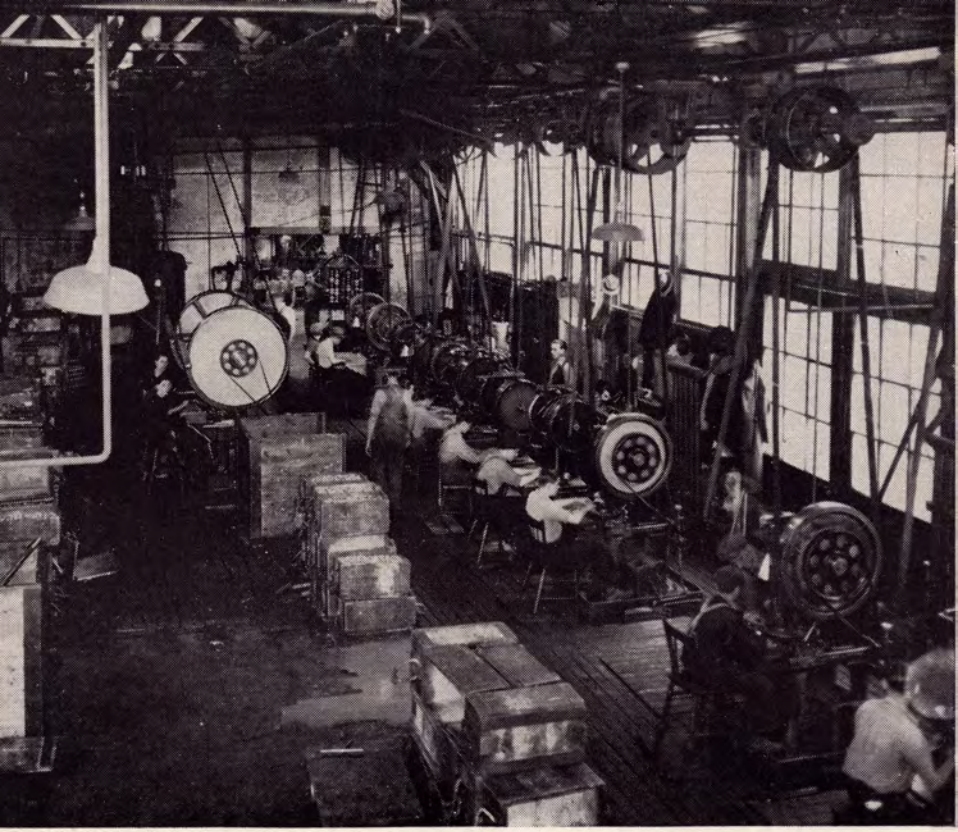


DISCING MACHINES
AT ST. MALO

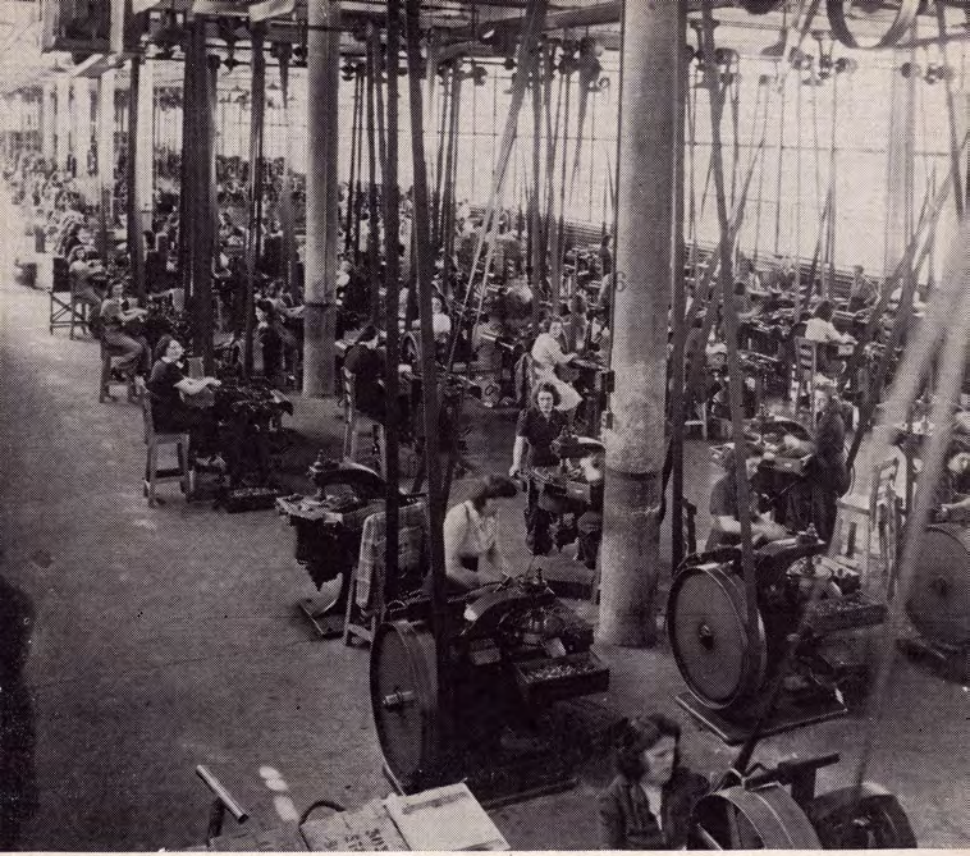


HEAD-TURNING OF THE .303″ CASES
AT ST. MALO

THE CAP DEPARTMENT AT ST. MALO

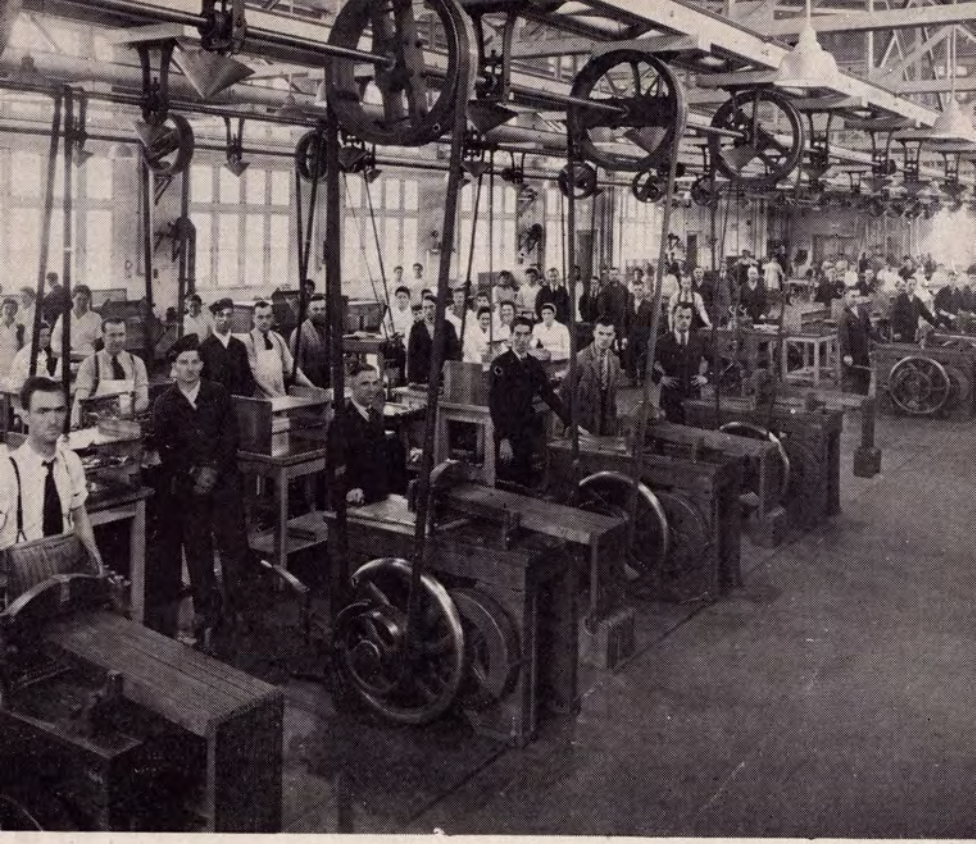


THE PALACE HILL BULLET DEPARTMENT
(IN USE UP TILL 1941)



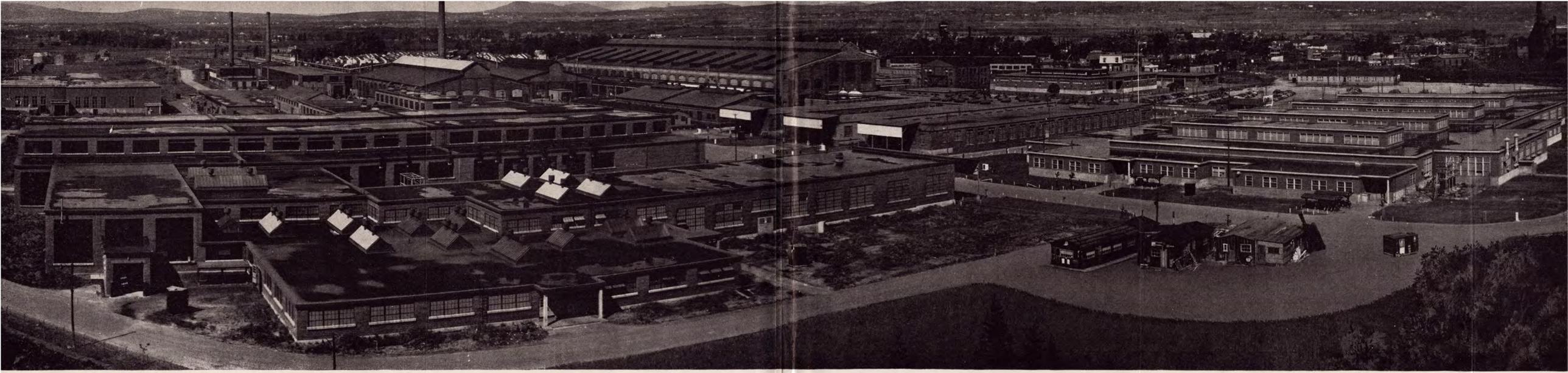
THE PRESENT-DAY BULLET DEPARTMENT AT ST. MALO

THE INSPECTION DEPARTMENT AT ST. MALO



THE FILLING OF CAP

THE TRANSPORT OF FILLED CAPS
FROM THE MAGAZINES TO THE ASSEMBLING DEPT.



ST. MALO

THE PLACING OF CASES IN TRAYS

PLACING THE LOADED PRIMERS IN TRAYS

INSERTING THE PRIMERS

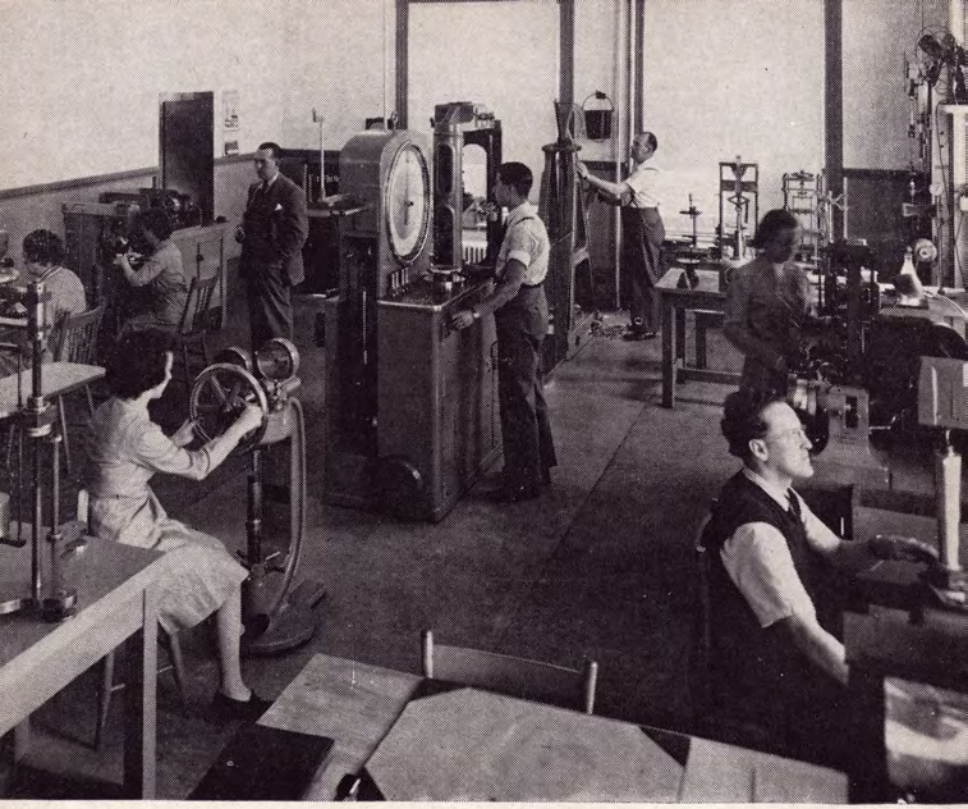
FILLING THE CASES

FINAL ASSEMBLY OF .303″ CARTRIDGES

BALLISTIC PROOF HOUSE

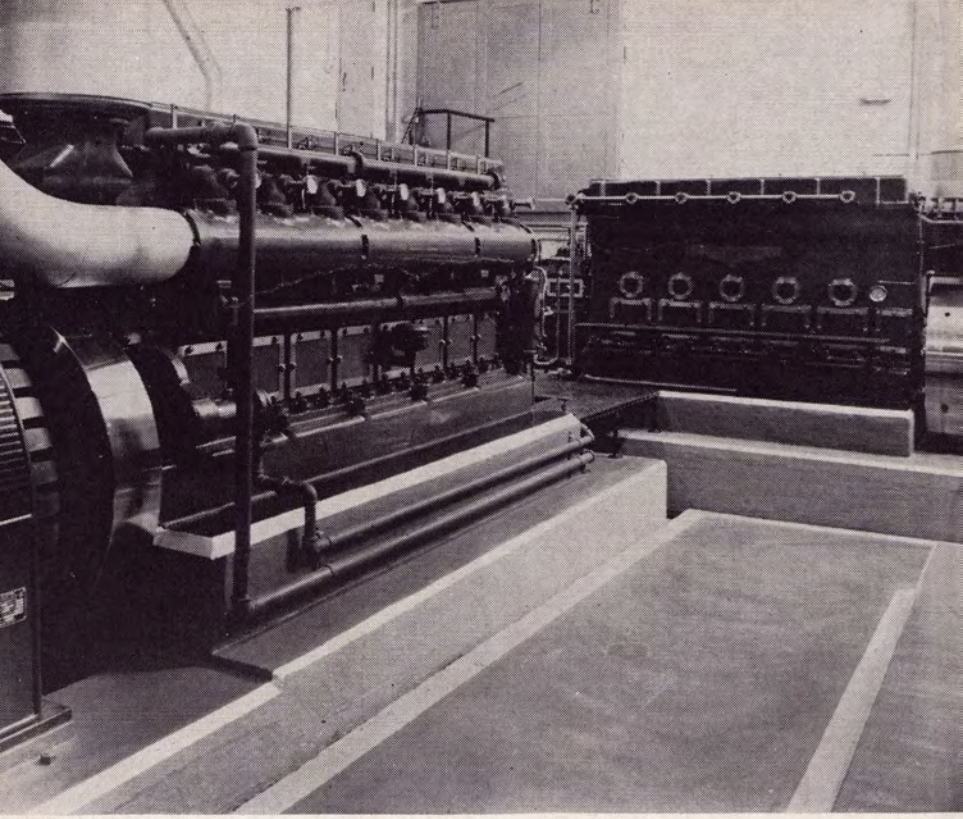
AUXILIARY SERVICES

THE CHEMICAL LABORATORY



THE PHYSICAL LABORATORY

THE FULMINATE SHELTERS
AND NO. 2 PLANT AT VALCARTIER



DIESEL MOTORS

THE KITCHEN

ONE OF THE DINING ROOMS

A DINING ROOM DECORATED FOR
THE CHRISTMAS AND NEW YEAR'S HOLIDAYS

THE SOCIAL SERVICE

ONE OF THE CLINICS

THIRD SECTION

APPENDICES

APPENDIX I

THE HEADS OF DEPARTMENTS

THE DOCTORS

THE HEADS OF DEPARTMENTS

Ansell, G. N.
Armstrong, G.
Bernier, A.
Boisjoly, A.
Boisvert, G.
Boulet, E.
Brown, W. G.
Bussières, A.
Carrier, A.
Chalifour, J. B. O.
Clavet, O.
Collin, W.
Côté, R.
Couture, C.
Dionne, S.
Fournier, J.
Frawley, M.
Gagnon, A.
Gauvreau, J. P.
Girard, B.
Grenon, J. A.
Guérard, L.
Hamel, H. P.
Hannon, O. J.
Laberge, P.
LaRochelle, J.
Leclerc, A.
Létourneau, C. E.
Lortie, A.
Miller, G.
McMillan, B.
Mowat, Mme F.
Paquette, A.
Paquet, W.
Pelletier, M.
Pépin, L.
Racine, O.
Rhéaume, J. A.
Rousseau, N.
Roy, M., Major
Sheppard, W. T.
Simard, A.
Saint-Hilaire, A.
Tardif, J.
Turgeon, P.
Vallières, U.
Walker, D. C.
Warren, P.

THE DOCTORS

Dr. Charles Lemaire
P. H. Foucher
R. Guimont
Dr. R. Lachance
D. Levasseur
A. Mercier

APPENDIX II

THE NAMES OF EMPLOYEES WHO WORKED IN THE DOMINION ARSENAL DURING THE TWO WORLD WARS.

EMPLOYEES WITH FROM 25 TO 45 YEARS OF SERVICE IN THE ARSENAL

NAMES OF EMPLOYEES WHO WORKED IN THE DOMINION ARSENAL DURING THE TWO WORLD WARS.

— A —

Ansell, G. N.
Armstrong, E.
Audibert, Joseph

— B —

Bélanger, Wellie
Bernier, Armand
Bérubé, Emile
Bigaouette, Adélard
Bilodeau, Jos. C.
Binet, Antoinette
Bisonnette, Wilfrid
Boivin, Clarisse
Boivin, Marie
Boivin, Alfred
Boivin, J.-Baptiste
Boisjoly, Alexandre
Bolduc, Marie-Anna
Bonenfant Ernest
Boulet, Evariste
Boutin, Albert
Bradley, Fred
Breton, Pierre
Bussières, Albert
Boyte, Philémon

— C —

Caron, Mme B.
Cauchon, Lucien
Chalifour, J. B. O.
Charland, Joseph
Chrétien, Albert
Chrétien, Joseph
Clavet, Omer
Cloutier, Gédéon
Cloutier, Rodolphe
Cooper, George
Cornell, H. J.
Côté, Georges
Côté, P. Oscar
Couture, Victor

— D —

Deschesnes, Rodolphe
Després, Emile
Dion, Jeanne
Dion, Marie-Anna
Drolet, Joseph
Dubois, Mme Maria
Dumontier, Jos.

— E —

Egan, Ernest

— F —

Ferland, Joseph
Filion, Odilon
Filioux, Joseph
Fiset, Antoine
Fiset, Albert
Fleming, Andrew
Fleury, Edmond
Fleury, Rosario
Fournier, Joseph

— G —

Gagné, Phydime
Gagnon, Louis
Gagnon, Lucien
Gamache, Lorenzo
Genest, A.
Gouge, Fernand
Gouge, Napoléon
Gendron, Arthur
Gendron, Rodolphe
Gervais, Rose-Alma
Giroux, Cyrille
Grenier, J. M.
Grenon, J. A.
Grenon, Rasario

— H —

Hallé, Hubert
Hannon, O. J.
Herman, Albert
Herman, Charles

— J —

Jobin, Alice

— L —

Labé, Alfred
Laberge, Philéas
Labrecque, Alfred
Labrecque, Joseph
Labrie, Albert
Lapointe, Florian
Laroche, Wilfrid
LaRochelle, Joseph
Lavoie, Donat
Leclerc, Adélard
Lemay, Edouard
Lortie, Alfred

— M —

Martin, Louis
Masse, Albert
McMillan Benjamin
Mecteau, Edmond
Mecteau, Edmond, Jr.
Mecteau, J. P. Honoré
Métivier, Louis
Métivier, Adélard
Métivier, Omer
Miller, Alfred
Moisan, Ernest
Morin, Joseph
Morissette, Adélard

— N —

Nadeau, Annoncia
Newton, S. G

— P —

Pakenham, Albert
Paré, R.
Parent, Géraldine
Paquet, Charles
Patry, Paul Emile
Pearson, George
Pearson, F.
Pelletier, Joseph
Pelletier, Victoria
Poirier, Eudore
Poitras, Edgar
Potvin, Marie-Anna
Plante, Réal
Prémont, Joseph

— R —

Racine, Gérard
Racine, Napoléon
Read, Ed.
Robitaille, Alfred
Robitaille, Arthur
Robitaille, Louis
Rousseau, Napoléon
Ruthven, E. M.

— S —

Sheppard, W. T.
Simard, Albert

— T —

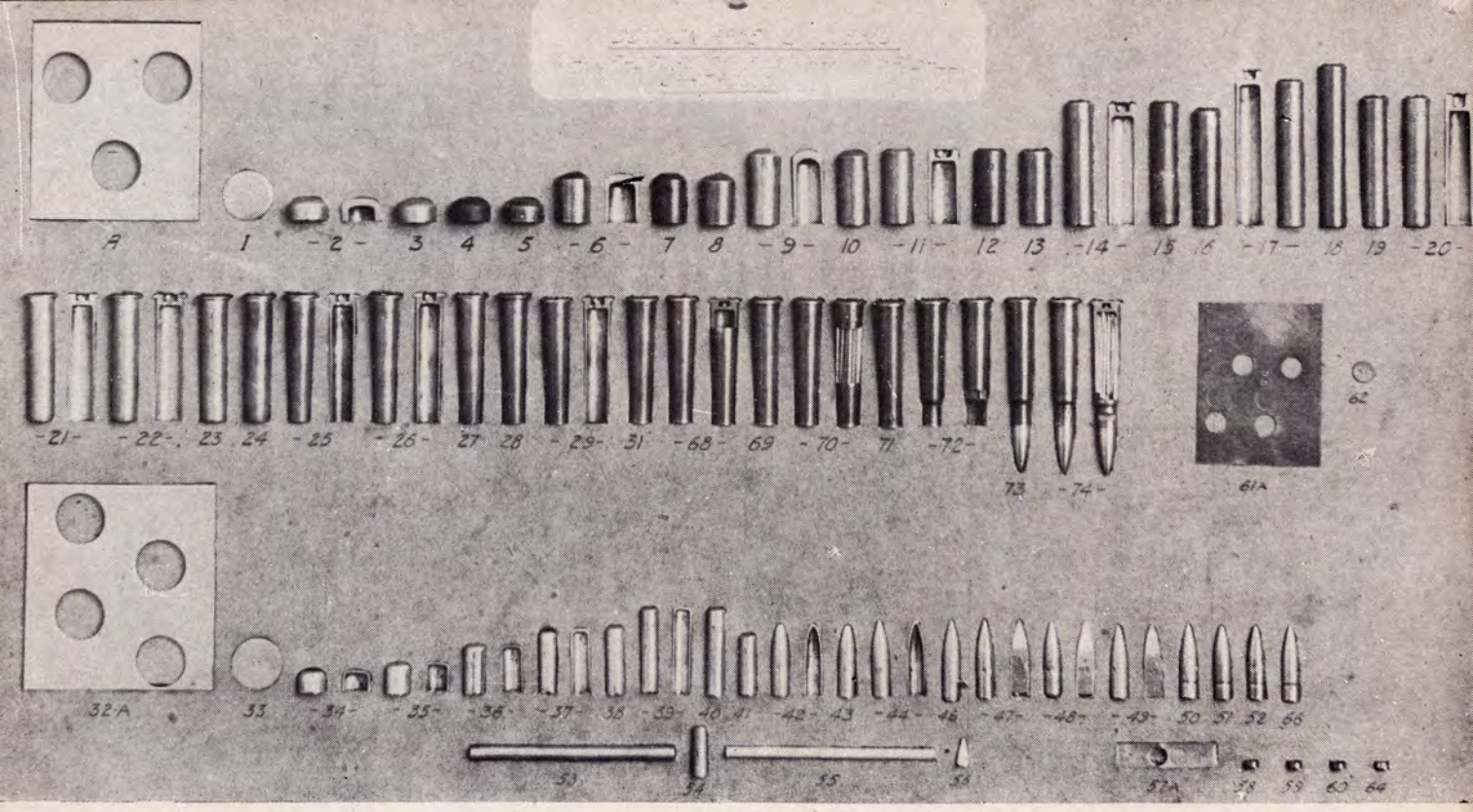
Théberge, Alfred
Thibaudeau, Josaphat
Thibault, W.
Trépanier, Ernest
Trépanier, J. B.
Trudel, J. Ludger

— V —

Vallée, Henri

APPENDIX III

ENUMERATION OF THE PRODUCTS MANUFACTURED AT THE ARSENAL SINCE ITS FOUNDATION



A SAMPLE OF THE OPERATIONS REQUIRED FOR THE MANUFACTURE OF A CARTRIDGE

ENUMERATION OF THE PRODUCTS MANUFACTURED AT THE ARSENAL SINCE ITS FOUNDATION

CARTRIDGES	S.A.	.303 Ball. Mk VII.
"	"	.303 Ball. Mk VI.
"	"	.303 Ball. Mk VII for D.R.A. and P.R.A.
"	"	.303 Ball. Mk VII Red Label
"	"	.303 Ball. Mk VII Standard
"	"	.303 Proof Q. Mk IV.
"	"	.303 Dummy U. Canadian Pattern
"	"	.303 Drill D 1942 Canadian Pattern
"	"	.303 Armour Piercing W Mk I.
"	"	.303 Incendiary B. Mk I.
"	"	.303 Tracer G. Mk I.
"	"	.303 Blank Mk V L.
"	"	.303 Gallery Practise Mk II and III.
"	"	.303 Rifle Grenade (30 grams Ballistite)
"	"	.303 Rifle Grenade (43 grams Cordite 4¼)
"	"	.303 Tube Percussion Mk IV.
"	"	8MM. Ammunition.
"	"	.22MM. Long Rifle.

CARTRIDGES S.A. ARMOUR PIERCING .5 W Mk I Vickers.

CARTRIDGES AIMING Rifle 1-- Electric Mk III.

CARTRIDGES Aiming Rifle 1--Percussion Mk III.

CARTRIDGES Aiming Rifle 1-- Electric Mk III Standard.

CARTRIDGES Aiming Rifle 1-- Percussion Mk III Standard.

CARTRIDGES	.55	Armour Piercing	Mk II Standard
"	.55	"	Mk II
"	.55	"	Dummy
"	.55	"	Drill.

PRIMERS No. 1 Mk II.
" No. 3 Mk II.
" No. 2 Mk II for 3 and 6 pr.
" No. 2 Mk VI for 3 and 6 pr.
" No. 1 Mk V.
" No. 26 Mk II.

PUFF POWDER R.L.G. 2.
" 4 oz. Blank L.G.
" No. 6, Mk I.
" No. 9 Mk II (4 oz)
" No. 8. 2 oz. Mk II.

CARTRIDGES B.L. or B.L.C. 12 or 15 pr. Blank 1 Lb. 4 oz.
" " 60 pr. 6 lbs. 6 oz. Cordite M.D. Size IIMk 1 L
" " 60 pr. 9 lbs. 7 oz. Cordite .093 Mk I.
" " 6" Blank Gun 7 lbs. L.G. or G. 12 Mk I L.
" " 6" Gun 23 lbs. Cordite M.D. 16 Mk. VIII.
" " 6" Gun 11½ lbs. Cordite M.D. 16 Mk VI.
" " 9.2" Gun 53½ lbs. Cordite M.D. 26 Mk.I.L
" " 10" Gun Model 1888 Mk L. and II.

CHARGERS .303" CARTRIDGES Mk II.
" .303" " Mk III.
" .303" " Mk IV.

OIL BOTTLES for 303 Rifles.
AIR FORCE BOMB H.E. AIRCRAFT G.P. 20 lbs. Mk I Dummy.
" " G.P. 20 lbs Mk I.
" " G. P. 250 lbs. Mk I.

RIFLE CHESTS FITTINGS. FOR PACKING RIFLES.
OVERHAULING & REFILLING Time Percussion Fuze No. 80
" " " Fuze No. 180 Mk VII.

CARTRIDGES 20MM. Hispano Suiza.
" 20MM. " " Proof.
" 20MM. Oerlikon.

COLD ROLLED AND ANNEALED SHEARED STRIP

50 Caliber
Scrap from unsheared strip

30 Caliber
Scrap from sheared strip

WEBBING SCRAP LEFT AFTER BLANKING AND CUPPING

Various types of cups
as furnished to the Arsenals

Unfinished bullet jackets—
ready for filling and finishing

A REPRODUCTION FROM "A RECORD OF SUPERIOR STEEL CORPORATIONS"

CARTRIDGES Q.F. 2 pr. Blank Filled Mk I.
" " 3 pr. Sub Calibre.
" " 6 pr. Sub Caiibre.
" " 6 pr. Hotchkiss 8 cwt. Fun.
" " 6 pr. 7 cwt. Blank Mk I.
" " 12 pr. 12 cwt. Fillied 2 lbs. Cordite with Adapter Mk VI.
" " 12 pr. 12 cwt. Naval.
" " 12 pr. cwt. Naval Reduced charge.
" " 13 pr. 9 cwt. R.D.B. Anti-Aircraft Target Shell.
" " 18 pr. Cordite Shrapnel.
" " 18 pr. HE. Streamline Shell Plugged.
" " 18 pr. Shot Proof Cylinder.
" " 18 pr. Shot Proof Streamline.
" " 18 pr. Blank Filled 1 lb. L.G. or G. 12.
" " 3" 20 cwt.
" " 4.5 How. Filled 15 oz 14 drms. cordite.
" " 4.5 How. Filled Blank Mk II.
" " 24 pr. Cases Empty Mk II.
" " 25 pr. Blank Filled 1 lb. L.G. or F.R.G. 2.
" " 6 pr. Shot Proof.
" " 1 pr. Cwt Blank filled Mk II with Primer.
" " 10 pr. Cordite Reduced charge shrapnel

ADAPTER BREECH LUG CARRIAGE FIELD, Q.F. 18 pr. Mk I and II.

CLIPS. 18 pr.

NEW AND REPAIRED BOXES:—

A.S.A. H I M .
A.S.A. H. 13.
A.S.A. Pistol H I Mk III.
A.S.A. Packing Tube Percussion No. 3 (local patterns)
Cartridges Q.F. 4.5 inch. How C. 19.
Projectile Q.F. 4.5 inch. How C. 53.
18 pr. C. 151 Mk I.
18 pr. C. 28 Mk I.
12 and 14 projectile.
12 pr. 12 cwt. Land Service.
Cases Powder M. 49 Mk I.

Cases Drum cordite 5–2.
Am. 3 pr.
Am. 6 pr.
Cases Powder Metal. Whole Half and Quarter.
Am. 4.7 Cartridges.
Am. for 25 pr.
22" Long Rifle.

REFORMING CASES.

CARTRIDGES Q.F. 2 pr. Cases Empty Mk I-L.
" " 6 pr. 6 cwt. Cases.
" " 18 pr. Mk II-III and IV.
" " 12 pr. 12 cwt.
" " 6 pr. 7 cwt.
" " 4 Gun short.
" " 40 MM.
" " 4.5 How.
" " 4.7 Mk III.
" " 6-- Gun Short.
" " 6 pr.
" " 75 MM.
" " 17 pr. Mk I and Mk II.
" " 3.7 Gun.
" " 25 pr.
" " 3 pr. 20 cwt.
" " 3 pr.

SHELLS FILLED BY D.A.

SHELL 6 pr. 8 cwt. Gun.
" 18 pr. Shrapnel.
" 18 pr. H. E.
" 12 pr. 12 cwt. Land Service.
" 12 pr. 12 cwt. Naval
" 4.5 H.E.
" 8"
" 3" 20 cwt.

APPENDIX IV

THE GROUP OF EMPLOYEES OF THE DOMINION ARSENAL WHO FOUGHT OVERSEAS IN THE WARS OF 1914-18 AND 1939-45

THE GROUP OF EMPLOYEES OF THE DOMINION ARSENAL WHO FOUGHT OVERSEAS IN THE WARS 1914-1918 AND 1939-1945

— A —

Alain, Bruneau
Albert, Patrick
Audet, Clément
Auger, Jean-Bruno
Atkins, Wilfrid

— B —

Barrette, Albert
Bedford, Charles
Bedford, Frédérick
Bergeron, Alfred
Bergeron, Rosario
Bernier, Raymond
Berthiaume, Wilbrod
Bertrand, Henri
Bérubé, Joseph
Bérubé, Lucien
Bilodeau, Ludger
Binet, Léo
Bissonnette, Paul
Blais, Lucien
Blais, Roger
Blanchette, Auguste
Blouin, Arthur
Blouin, Fernand
Boily, Marcel
Bouchard, Donat
Boucher, Léonidas
Boudreau, Pierre
Boutet, René
Boyd, Elmer
Brown, Jean Paul
Bussière, Gaston

— C —

Casista, Marcel
Chalifour, Maurice
Chantal, Dominique
Chapadeau, Cléophas
Chartier, Emile
Chiasson, Jean Paul
Cinq-Mars, Emilien
Clarke, Georges
Collin, Gérard
Collin, Maurice
Connely, Charles
Couture, Victor
Cyr, Cyrille

— D —

Daigle, Abraham
D'Auteuil, Gérard
Demontigny, A bert
Déry, Jean-Marie
Desjardins, Vincent
Desruisseaux, Fernand
Devine, Charles
Dion, Charles
Dion, Louis Philippe
Dodier, Irénée
Dolan, Thomas
Dorval, Wilbrod
Drapeau, Marcel
Drolet, Ovila
Drolet, Lucien
Duchesneau, Albert
Duggan, Joseph
Dumontier, Jean Hilaire

— E —

Eastbrook, Earl
Eastbrook, F.
Ellefson, Godfry
Ellefson, Yvon
Edmond, Aimé

— F —

Falardeau, Cyrille
Falardeau, Jean Paul
Falardeau, Paul
Ferland, Thomas
Fitzgerald, Walter
Fortier, André
Fortier, René
Fortier, Roger
Fortin, Roland,
Fournier, Raoul
Furlong, Alexander

— G —

Gagne, Georges Henri
Gagnon, Joseph
Garneau, Lucien
Gaudreau, Laurent
Gilbert, Joachim
Gingras, Benoît
Godbout, Roger
Gosselin, Henri
Gouge, Napoléon
Goulet, Eugène
Gravel, Emile
Gravel, Louis
Grenier, Philippe
Guay, Almanzor
Guay, Jules
Guénard, Joseph
Guenette, Robert

— H —

Haberlin, Patrick
Hébert, Marcel
Hodgson, Victor
Hommerston, Gaston
Houde, Samuel

— J —

Jacques, Roland
Jefferson, Cedric
Jobin, Paul Emile

— K —

Kean, Lawrence
Kirouack, Albert
Kirouack, Allen
Kirouack, Raymond

— L —

Labbé, Paul Emile
Labrie, Wellie
Lachance, Charles Henri
Lachance, Numa
Laflamme, J. Baptiste
Lafrance, J. Baptiste
Lamontagne, Emilien
Lamontagne, Eugène
Langelier, Valère
Langlais, Louis
Langlais, Maurice
Langlois, David
Lapierre, Antoine
Lapointe, Paul Henri
Larivière, André
Lavoie, Maurice
Leahy, Walter
Lebel, Robert
Lebel, Rosario
Leblanc, Théodore
Leclerc, Nérée
Lefrançois, Léandre
Létourneau, Eudore
Léveillé, Donat
Loignon, Roland
Love, Gérard
Lyons, Desmond

— M —

Mally, Jacques
Marier, Bernard
Martineau, Charlemagne
Matton, Lionel
Ménard, Clodimir
Ménard, Roméo
Mercier, Joseph
Mercier, Marcel
Michaud, Horace
Miller, Ernest
Miller, Jean Marie
Monfette, Herman
Morais, Raoul
Morin, Albert
Munro, Paul

— N —

Noel, Philias

— O —

O'Brien, Gérard
O'Neil, Ernest

— P —

Pageau, Alexandre
Paquet, Paul Emile
Paré, Simon
Parent, Raymond
Patrick, Albert
Patry, Paul Emile
Perron, Benoît
Phillips, Benjamin
Picard, Alfred
Picard, Edouard
Pichette, Albert
Poirier, Rogers
Porter, William
Poulin, Emile
Power, Joseph
Provençal, Louis

— R —

Racine, Emanuel
Racine, Robert
Renaud, Joseph
Renaud, Marcel
René, Marc
Rhéaume, Gérard
Rioux, Jean
Rioux, Marcel
Robitaille, Gérard
Robitaille, René
Rochefort, Joseph
Rochette, Rock
Ross, Jean-Charles
Rouleau, Dieudonné
Rousseau, Louis

— S —

Saint-Laurent, Lionel
Sauvageau, Charles
Shannan, Charles
Simard, Maurice
Simard, Roger
Sirois, Jos. Henri

— T —

Thériault, Lucien
Thériault, Roland
Thibaut, Gaston
Thivierge, Ulric
Tousignant, J. Louis
Towensely, Denis
Tremblay, Fernand
Tremblay, Philippe
Trudel, Fernand
Turcotte, Joseph
Turcotte, Lucien
Turgeon, Jean

— V —

Vallée, Léo
Vaudreuil, Emilien
Vaudreuil, Marcel
Vézina, Armand
Vézina, Georges
Vézina, Roger

— W —

Wagner, Roger
Wiseman, Albert

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